VETERINARY MEDICINE LIBRARY
OHIO STATE UNIVERSITY
NOV 23 1961
LIBRARY
NOV 27 1961

THE JOURNAL OF THE BRITISH VETERINARY ASSOCIATION

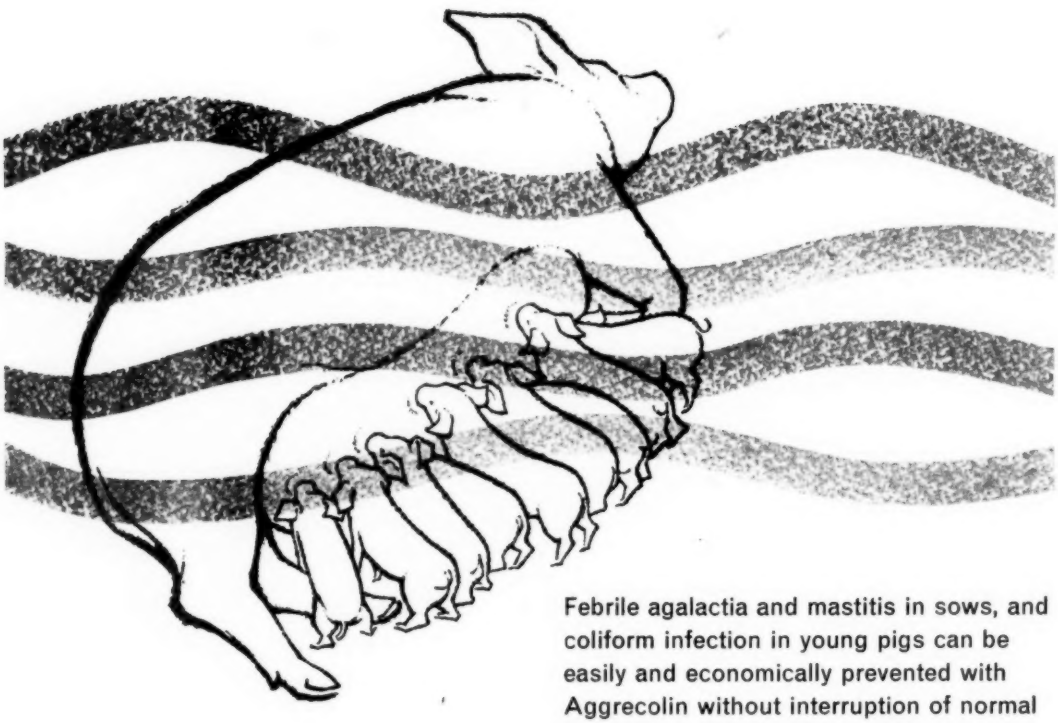
The Veterinary Record

PATRON: HER MAJESTY THE QUEEN

Vol. 73 No. 44 Issue No. 4354 1095-1138 Registered as a Newspaper

AGGRECOLIN*

for the prevention of
febrile agalactia
and mastitis in sows
and coliform infection
in piglets



Febrile agalactia and mastitis in sows, and coliform infection in young pigs can be easily and economically prevented with Aggrecolin without interruption of normal lactation or feeding. Aggrecolin, a polyvalent bacterial antiserum, provides a passive immunity against organisms commonly associated with these diseases, thus saving losses among animals in contact with infection or on infected premises.

AGGRECOLIN

10188 * Trade Mark

Pfizer PFIZER LIMITED · SANDWICH · KENT

THE VETERINARY RECORD

Founded by William Hunting, F.R.C.V.S., in 1888

Volume 73
No. 44

SATURDAY, NOVEMBER 4th, 1961

7 Mansfield Street,
London, W.1.
Museum 6541

Congress Papers

Some Aspects of Dog Nutrition*

BY

R. GORDON BOOTH

Petfoods Ltd., Melton Mowbray, Leicestershire

BECAUSE the dog has been used for a great number of years as an experimental animal in researches of very great diversity, quite a lot is known about its nutritional requirements. Such basic information as has been secured has been well summarised notably by McCay (1949), Michaud and Elvehjem (1944), and by the National Research Council of U.S.A. (1954); but an up-to-date and substantially complete survey is now overdue. Current information, extensive though it is, leaves quite a lot of gaps in our knowledge—many more than exist, for example, in the nutritional knowledge concerning what might be termed "economic" or "crop" animals such as cattle, pigs and sheep. This is due to some obvious reasons, such as that kennels work on different lines and normally in much smaller units than does the average farmer, and to some less obvious ones such as that breed size, general characteristics, and behaviour in the dog are subject to much more variation than obtains in normal breeds of cattle, sheep and pigs.

It is a truism to say that any failure to supply the full nutritional needs of a dog leads to greater susceptibility to pathogen invasion and eventually to some form of actual deficiency disease. This shows itself most frequently and readily during the rapid growth of the weaned puppy, and with the bitch during the stressful time of pregnancy and rearing a litter; but it can arise at any time in the life cycle. Though the average dog can adapt itself to quite remarkably simple and austere diets *e.g.*, the sheepdog (Greig, 1953), nevertheless certain nutritional requirements must be met if it is to remain healthy.

A staring coat is a very non-specific diagnostic sign and can arise from a great variety of conditions. It can, however, be purely nutritional in origin and can readily arise as the initial symptom from a lack of essential fatty acids (linoleic and arachidonic) in the diet. The normal requirement of these amounts to about 2 per cent. of the total caloric value of the diet, and quite frequently in these days of artificial hardening (hydrogenation) of fats, dietary fat source may be lacking in them. The addition of some lard to a deficient diet can frequently effect a rapid and marked improvement. In point of fact, whereas a true protein or carbohydrate derangement is difficult to recognise, shortage of fat—and particularly of the right sorts of fat—is much simpler to detect. The work of Hansen and Wiese (1955) at the University of Texas has markedly enlarged our knowledge of the essential fatty acid deficiency syndrome in dogs.

The necessity for adequate supplies of fat *qua* fat in the diet of the dog has recently been explored by Udall (1954). He demonstrated that the ability of growing dogs to overcome the stresses of cold and work, could be favourably influenced by an increase in the caloric fat intake—maintaining at the same time adequate caloric intake of protein and carbohydrate. Udall maintains that this stress-relieving function of fat operates in acute infectious disease conditions as well as in the two stresses he studied, cold and work. If this latter contention should prove true, it may be somewhat difficult to apply in practice, as fat may well be the least liked food component in the diet of a sick animal. The use, however, of milk and/or cream may provide an acceptable source of fat.

Udall's experimental work is in line with the findings of many Arctic and Antarctic expeditions where husky dogs have been used to pull loads under extreme climatic conditions. For these dogs a very much higher level of fat in their food than is normally used and than can normally be tolerated by dogs is provided, enjoyed and, in fact, found essential.

The dog has been used as an experimental animal in work concerned with what might be termed the fat/cholesterol/atherosis/arteriosclerosis theory but has

* Paper presented to the Annual Congress of the British Veterinary Association in Oxford on Tuesday, September 5th, 1961.

produced no significant results. This work has been reviewed by Worden (1960), and on current evidence there would so far appear to be no contra-indication to the feeding of high-cholesterol fats to dogs

Fats are, of course, the carriers of the fat soluble vitamins and a brief reference here to them and to the function of one of them in relation to mineral balance and requirements is appropriate. It is generally assumed that dogs require vitamin E, but little or no work has been done on this subject since that of Anderson *et al.* (1939, 1940). Breeding failure and muscular dystrophy must always be considered as being possibly due to lack of vitamin E and the use of wheat germ oil dosing or tocopherol injection form an appropriate treatment. Such deficiency, however, is probably rare. Likewise, serious shortages of vitamins A and D are rare in these days of more enlightened feeding, whilst the particular needs of the puppy and whelping bitch are generally realised due to the stress which has been laid on these vitamins in human nutrition.

Campbell (1960) of last year's B.V.A. Congress demonstrated anew for the growing dog that vitamin D, whilst known to be necessary for mineral absorption, cannot overcome serious imbalance between calcium and phosphorus, and as is well-known and implicit from the review section on the subject by Worden (1960), the incidence of severe mineral imbalances in dog foods not prepared under proper supervision and without knowledge of the facts is widespread.

Once more, a widely held and fundamental misconception about the dog can lead to serious dietary deficiencies. Even carnivores such as lions, tigers and leopards have been shown (by stomach content examination) to consume vegetable matter in their wild state; the carnivorous dog, likewise, should really be considered to be an omnivore and is quite capable and fitted by Nature to digest starchy foods even when these are uncooked. On an exclusive diet of raw or cooked meat with its Ca : P ratio around 1: 40 serious trouble is not long in coming. A syndrome which involves initially a degree of hind-quarters paralysis is seen in such cases; it can quickly be cured by changing from all-meat to a mixed diet or by the addition of calcium in some form to the meat. (Scott, 1961). Thyroid enlargement is a further symptom which can arise on all-meat feeding.

The general health of skin and coat is very much tied up with the adequacy of the supply of B vitamins in the diet and any deficiency in this direction can be met by the judicious use of a liver or of a yeast supplement. Excess of either of these food items is liable to cause gastro-intestinal upsets and therefore little and regular supplements should be the rule until such time as the condition clears up and adequate normal feeding is re-established. Rarely is it really necessary to go to the lengths of injecting these vitamins; however, being water soluble, saturation of the body with them is quickly followed by excretion or destruction of the surplus, and this may well imply a course of injections.

Certain members of the B group of vitamins, particularly B_1, are heat labile. It is, therefore, most important that food fed to a dog should either not have been overcooked or excessively processed in any way or that, when fairly severe processing is essential for preservation, as in canning, adequate vitamin fortification should have taken place so that residual vitamin content in the processed food is adequate.

The protein required by the dog is a matter which can be discussed only in the most general terms in the absence of getting down to very lengthy and involved detail on individual cases. This is so because requirement of the "ideal" protein varies during the lifetime of the dog, being greatest for the growing puppy and in the later stages of pregnancy in the bitch, and least in the geriatric phase of life. The actual amount of protein required will vary in relation to the proportions of the various amino-acids present, and the extent to which they comprise the ideal mixture. As is mentioned in the Michaud and Elvehjem (1944) review, mixtures of cereal proteins have proved perfectly satisfactory in canine nutrition, though a fairly substantial proportion of meat is customarily fed. Meat, due to its content of higher quality protein, supplies more efficiently the needs of the dog for the building of a given amount of body tissue than does the average vegetable protein, which is liable to be deficient in one or more of the essential amino-acids.

What happens now to the surplus protein building bricks, the amino-acids, which are not required in the formation of body tissues? They, of course, are metabolised to give energy in the same way as carbohydrate and fat, but unlike carbohydrate and fat which under normal conditions produce only CO_2 and water on utilisation, protein gives rise to materials which cannot be removed by the lungs or as plain water *via* the kidneys. Such materials include urea, and in the case of the Dalmatian, hippuric acid.

This situation clearly has a major bearing on the nutrition of the dog which has suffered kidney damage arising, as can be the case, from such varied causes as infectious hepatitis, distemper or leptospirosis. Such animals with impaired renal function should be given the minimum possible amount of protein compatible with maintenance of bodyweight, and this protein should be of the highest possible quality—preferably all meat, with suitable mineral adjustment for reasons previously mentioned. By this means the minimum amount of protein is metabolised and the smallest strain is placed on the damaged kidneys.

The energy requirement of the dog varies enormously with breed and with the level of activity of the individual animal. Once the fat requirement—a minimum of about 5 per cent. in the food but preferably a little more—has been met, the remaining energy is best derived from carbohydrate. This carbohydrate should normally be starch, and its utilisation is improved and untoward effects on the intestine are avoided if it is gelatinised before feeding. An excess of raw starch was shown by McCay (1949) to produce diarrhoea, and similar trouble can be induced by feeding lactose or an excess of milk solids. It is advantageous when feeding starch to do so as whole (or whole, ground) cereal, of which, of course, starch forms the major part, as by this means the

vitamin B_1 necessary for the metabolism of the carbohydrate is provided at the same time. The feeding of sugar to dogs is not to be recommended; excess of sugar can have similar harmful effects on the teeth to those which have been shown to occur in humans, and refined sugar is lacking in those accessory food factors which are naturally present in unrefined cereals and in the majority of other alternative sources of carbohydrate.

It is surprising that hardly any work should have been done on water requirements of the dog, but this is understandable in that only in the past few years has anything been done on human water requirements. All that can be said is that water is just as essential in dog nutrition as it is for humans, and that water should very frequently be available, particularly so immediately following the main (or only) meal of the day.

Having relatively recently had the opportunity to see the isolated and completely disease- and parasite-free dogs at Cornell University, all fed on a very simple and straightforward diet—but a diet which, when fed to animals kept normally is no more than average in results obtained—it has become clear that nutrition is seriously affected by factors far removed from protein, fat, carbohydrate, minerals and vitamins.

The special isolated disease-free Cornell dogs were superior in every way to their counterparts kept under normal conditions—better coat, brighter eye, more active and lively and so on.

Here was an instance where no overt disease, no characteristic symptom or syndrome was present in the normal dogs, but they were unable to make as good use of their food as the disease-free dogs. How much more is this the case when there is quite definite disease and marked interference with normal nutrition.

Malnutrition can be caused by many factors other than an actual deficiency in the diet. Among some of the obvious factors involved are such troubles as infestation with hook-worms, round-worms or tape-worms, which interfere with nutrition by consumption of some of the food intended for the dog, by intestinal irritation and in some cases by causing actual haemorrhage. Infection of the gut with coccidia can also cause severe inflammation and haemorrhage. Nearly all the infectious febrile diseases can cause conditions in the intestine ranging from "looseness" to frank diarrhoea, and in all such cases absorption of nutrients is impaired—in the last resort parenteral feeding may have to be attempted. Less obvious infections leading to "below par" states can also impair the absorption of nutrients and make necessary special supplementation of the diet.

In rather a different classification comes the effect of palatability or acceptability upon the state of nutrition of the dog. To this factor should perhaps be added that of appetite—the two will clearly interact on each other. It is abundantly clear that without good appetite and reasonable acceptability there will be imperfect nutrition. Whilst we know a good deal about the acceptability of different food components, both individually and in mixtures, we know little about other factors which influence appetite.

In conclusion, reference must be made to a method by which the nutrition of those dogs which need dietary treatment and which are entrusted to the care of the veterinary surgeon may be most satisfactorily assured without the necessity for individual diet sheets and all the uncertainties and difficulties which normally attend the implementation of a prescription diet. In the U.S.A. ready prepared "Prescription Diets," formulated by veterinary surgeons for the exclusive prescribing use of veterinary surgeons are well established. They are formulated to be satisfactory in the dietary treatment of such conditions as nephritis and cases of permanent kidney damage, obesity, enteritis, pregnancy, etc. Plans are being implemented to make a range of such diets available in Britain and, as in U.S.A., available only to the veterinary surgeon exclusively for his dispensing. Not only will the nutritional features of such diets be made as adequate as present knowledge allows, but it is hoped that they can also be made very palatable.

References

AGRICULTURAL BOARD, Division of Biology & Agriculture, National Research Council of U.S.A. (1954). "Nutrient Requirements for Dogs." Washington, D.C.

ANDERSON, H. D., ELVEHJEM, C. A., & GONCE, J. E. (1939). *Proc. Soc. Exp. Biol. & Med.* **42.** 756.

———, ———, & ———. (1940). *J. Nutr.* **20.** 433.

CAMPBELL, J. R. (1960). *Vet. Rec.* **72.** 1,153.

GREIG, J. R. (1953). *Brit. Vet. J.* **109.** 14.

HANSEN, A. E., & WIESE, H. F. (1955). Paper read at Dog Food Convention, Chicago, Sep. 14/15.

MCCAY, C. M. (1949). "Nutrition of the Dog." 2nd ed. Cornstock Pub. Co., Ithaca, N.Y.

MICHAUD L., & ELVEHJEM, C. A. (1943). *Nutr. Abs. & Rev.* **13.** 323.

SCOTT, P. (1961). *Brit. J. Nutr.* **15.** 73.

UDALL, L. (1954). "Gaines Vet. Symposium."

WORDEN, A. N. (1960). *Vet. Rec.* **72.** 2.

The Speaker's Introduction

The Chairman, Mr. G. N. Henderson, said that Dr. Booth was unable to be present and at the very last minute Mr. A. J. Harms, Chief Chemist of Petfoods Ltd., had stepped into the breach, having been preparing notes all through the night. He hoped that there would be an interesting discussion on the paper, which was on a very important subject.

Mr. A. J. Harms said that Dr. Booth would wish him to say how sorry he was not to be able to be present, and how honoured he was to have been given the opportunity of presenting a paper to the Congress.

He himself had endeavoured to put into words what he imagined Dr. Booth would say in introducing the paper.

In presenting the paper, those aspects of practical dog nutrition applicable to the everyday feeding of dogs had been stressed. The large increase in usage of prepared foods for dogs which had taken place in the last decade had made it increasingly important that those aspects should be borne in mind, but in addition kept in their true perspective by the manufacturers of such foods.

Prepared foods could only form the base, but albeit a very important base of any dog's diet, for it was manifestly impossible to put the optimum daily needs of every dog into one single product. As with children, one expected the member of the household responsible for the feeding arrangements to show some intelligence in that matter. Thus a canned food containing a small proportion of cereal was a satisfying diet for a very sedentary animal, but it needed the addition of extra carbohydrate in the form of cereal if the animal was taking a large

amount of exercise. The needs of a 2½ lb. toy dog would not be the same as a 250 lb. Newfoundland since the ratio of bodyweight to surface area would be vastly different, necessitating a different calorie intake: coat thickness would also influence that factor. As in man, there was probably the dog which ate *ad lib* and stayed thin, and the sparing eater who put on weight. As in the case of chickens, there might well be different vitamin requirements for different breeds.

In preparing foods for a mass market, cost played a part, and in that connexion a proper perspective in formulation or fortification to provide vitamins must be borne in mind and it should be sufficient to aim at fulfilling the basic needs of the majority of animals.

A factor probably of equal importance to nutrition was that of acceptance by the animal, for the perfect diet was of very little use if the animal refused to eat it or did not eat it with relish over long periods. In that connexion, the freshness of the raw materials from which the product was prepared and the texture of the finished product both played a part. It was interesting to note that, in America, where canned foods had a comparatively low acceptance by the animal, there had been a vast increase in the preparation of dried foods which had not been paralleled in this country where the general level of acceptance of the canned product was higher than in America. So far, there had been very little success, as far as could be judged, in covering up poor acceptance foods by the addition of artificial flavourings. A good deal of work was being done on that subject, particularly in America, but so far, he had not seen anything which stood up to test in the field.

It was not only in day-to-day feeding that applied nutritional knowledge played a part. Changes and extras in the diet required during the growing and reproductive periods and pre- and post-operatively involved the practical application of nutritional principles. It was particularly under those conditions that the veterinary practitioner had to play a major rôle and it was logical to assume that "prescription diets", prepared in a convenient and acceptable form and used under his jurisdiction, might prove a useful addition to his professional armoury. Much more study of both basic dog nutrition and also of the special needs of the dog under stress conditions was needed before optimum formulation of such diets could be achieved. The increasing interest of the veterinary profession in the nutritional aspects of small animal feeding, particularly in promoting good health would, it was hoped, stimulate research activity in that field.

The Chairman thanked Mr. Harms; those present were very grateful for the trouble he had taken at such short notice to present his most interesting introduction.

He then introduced Mr. Worden, who would open the paper. It really seemed unnecessary to introduce him to a veterinary audience these days since he was so frequently called upon to give talks and lectures and open discussions on all sorts of subjects. Nutrition, of course, was a popular subject on which the profession asked his help, and also laboratory animals. In fact, Mr. Worden was a man of many parts.

He was by background a veterinarian but was also a Cambridge biochemist. He was formerly Milford Research Professor in the University of Wales and, as most people knew, he was now Director of the Nutritional Research Unit at Huntingdon. He did a wide variety of work on human and animal problems—nutrition, pharmacology, toxicology, etc., and worked with large numbers of experimental dogs and cats. There was no one more fitted to open the paper than Mr. A. N. Worden.

The Opener

Mr. A. N. Worden thanked the Chairman for his remarks. He also thanked Dr. Booth for his paper, introduced by Mr. Harms at such short notice, and also congratulated him on his essential practical approach.

Dr. Booth had avoided any temptation to try to review even parts of that very large subject, he agreed wholeheartedly with him that an up-to-date and substantially complete survey was now overdue. There could be no disagreement with his statement concerning the wide variation in breed size, general characteristics and behaviour in the species and indeed, in the time available, it was feasible to attempt to comment upon a few aspects only of his paper and of related topics.

Dr. Booth had drawn attention to the superior characteristics of the isolated pathogen-free and parasite-free dogs at Cornell, with their better coat, brighter eye and greater activity and liveliness, as compared with ordinary animals on the same diet. That paralleled the experience with pathogen- and parasite-free pigs, poultry and other economic animals. He would hazard an opinion that such pathogen-free dogs not only made better use of their food constituents, as Dr. Booth suggested, but also had a higher requirement for various vitamin and other factors, at least during the growing stages. In that respect they would simulate young pathogen-free pigs, for which recommended levels of addition might prove inadequate. Studies such as those at Cornell emphasised the interrelationship between diet and health, and the fact that similar symptoms or lesions might develop either from dietary deficiency or from infection. Thus, in the dog, the lesions in certain forms of leptospirosis might resemble those of nicotinic acid deficiency or canine blacktongue. Greig in 1953 estimated the incidence of blacktongue among Scottish sheepdogs, with their unbalanced diet, was of the order of 11 per cent., and cases had been reported from parts of England, including Buckinghamshire.

Dr. Booth had referred to the dual rôle of fat in the diet, and the need for high fat diets under extreme conditions, for example, work in the Arctic and Antarctic. The Unit's studies in the Antarctic, and with pemmican diets fed to experimental dogs in this country, suggested however that one might go too far in relying solely upon protein and fat, plus vitamins and minerals. Very much better results were obtained, and by subsequent expeditions, with diets containing carbohydrate as well as fat, and certainly he would not advocate carbohydrate-free diets for dogs in any normal circumstances The studies indicated also the waste of feeding excessive levels of protein. On pemmican, a dried and concentrated food made mainly from beef, and consisting of about two-thirds protein and one-third fat, it was found that there were abnormal urinary changes, retention of water, indicanuria, and excretion of fluorescent substances, together with a reduction in the output of thiamine or vitamin B_1 and riboflavin. The dogs themselves sometimes lost weight and developed loose stools, even those confined to metabolism cages in this country. Part of the troubles might, however, have been associated with damage during manufacture.

The question of damage during manufacture led him to the controversial question of canned and other formulated dog foods, a topic that Mr. Harms had already touched upon during his introductory remarks. He had enjoyed friendly relationships and joint discussions at professional meetings for some years with both Dr. Booth and Mr. Harms and he knew they would not construe what he had to say as in any way an attack upon them personally or upon the important industry that they represented. Indeed, he added that the work of his colleagues at Huntingdon, and himself, was concerned much more extensively with human than with animal dietary problems, and that much the same fears prevailed in that other context also, although they were mitigated by wider ranges of foods taken by man in most countries. He felt, however, that it was only fair to bring the important topic of the nutritive value of such foods into the open, and that the thriving dog and cat food industry had much to gain from a solution of the problem of avoiding certain types of loss.

Posing the problem as he and his colleagues saw it, he would state that they had at the present time about a hundred experimental dogs—mainly of one single breed, the Corgi—and rather fewer cats to maintain, some for life and others in food and drug studies over periods varying usually from 6 months to 2 years or more. Those numbers were growing, and clearly, since expense of the food itself was something of a secondary factor, it would

be more than helpful if they could use throughout a simply prepared and standardised product such as a canned dog food. That would cut down the variables entailed in maintenance and in providing the full dietary requirements, and also in the preparation of the experimental as opposed to control diets. Unfortunately, they could not do so, since the animals simply would not maintain their condition unimpaired on such a regime. The signs of health and well-being mentioned by Dr. Booth were lost, and looseness of bowels was not infrequent, especially in cats. He would agree that the maintenance conditions of the experimental dogs, in respect of exercise and of availability of milk and other supplements, might differ from those of the feeding trial to which Mr. Harms had referred.

Dr. Booth had referred in his paper to lactose or excess milk solids as causing diarrhoea and stated on a previous occasion that lactose was, in fact, added to canned cat foods to ensure that constipation did not occur. He himself did not know whether there was a similar addition to dog foods, or whether the practice was still continued with cat foods, but would be grateful for a comment from Mr. Harms. Without any assistance food appeared to pass remarkably rapidly through the alimentary tract of the healthy dog or cat.

In any event, he wished to refer mainly to those losses or inactivations that might occur during processing and subsequent storage, and which it was believed was responsible for the less satisfactory performance of dogs and cats on canned foods as opposed to unprocessed foods of similar gross chemical composition. It was easy to speak glibly of fresh food, but one needed to know precisely what factors were diminished, lost or inactivated, and how such troubles might be rectified.

Dr. Booth and Mr. Harms had referred to vitamin B or thiamine. It might be recalled from the analyses published last year in the Consumers' Association (1960) journal *Which* ?, that there was a wide variation in the thiamine content of different brands of canned dog and cat foods, and that some of those for which Dr. Booth's organisation was responsible had clearly benefited from the addition of that vitamin, which was readily lost on processing. Arnold & Elvehjem (1939) dealt with the question of processing and thiamine over 20 years ago, and there was little doubt that that heat-liable vitamin might be lost all too readily. McCay (1949) had drawn attention to the fact that the dog-owner could recognise a shortage of vitamin B_1 through loss of appetite and a failure to excrete regularly, even though overfeeding and lack of exercise could produce similar symptoms. So far as exercise was concerned, Cowgill, Rosenberg and Rogoff (1931) showed that dogs on diets low in vitamin B_1 developed anorexia much more rapidly when forced exercise was given than when it was not. It was gratifying that Dr. Booth's and possibly other organisations were giving attention to vitamin B_1 and that the products, or some of them, were now adequate in that respect.

Vitamin E also might be lost on canning, although specific evidence had been published for cats rather than dogs.

Even more important was the effect upon the protein quality of the food. Work in which Mr. Harms had participated had shown the effect of drying conditions on the nutritive value of a processed stock diet for dogs. A diet that supported good growth in weanling rats when air-dried at temperatures below 140°C. produced fluctuating gains when dried at 150°C. and anorexia, stunted growth, poor coats and subsequent reproductive failure when dried at 160°C. Those symptoms were thought to resemble those of protein or amino-acid deficiency, even though chromatographic analyses did not reveal destruction of any essential amino-acids. The diet dried at 160°C. was, however, resistant to peptic digestion. The authors believed that, even at 140°C., there was damage to the protein through the formation of *N*-glycosides in the presence of reducing sugars.

Those findings were on air-dried diets, but with canned diets there was evidence of similar damage, at least in terms of lysine. In the analyses published in *Which*?, to which reference had already been made, there was evidence of considerable inactivation of that essential amino-acid. The total lysine, as determined microbiologically after hydrolysis, was adequate, but up to 50 per cent. or more failed to be accounted for when the specific method for available lysine was used. In his own laboratories, similar findings could be confirmed for many brands of canned dog and cat food. The *Which*? survey showed, also, considerable variation in the ability of the different canned foods to support growth in weanling rats.

Dr Booth had referred to supplements, particularly those based on liver and yeast. Good supplements that helped to rectify dietary deficiencies were, of course, most desirable but it was evident that such deficiencies might be complicated in the case of formulated foods.

Canned foods had been discussed since they formed a very high proportion of the purchased dog and cat food of this country, and since the author and presenter of the paper were 2 leading figures in the industry, they would, he hoped, be able to give some inside information on current technological developments. But it would be idle to suggest that that particular form of preservation was the only one that called for adverse criticism. As Mr. Harms had pointed out, there had been considerable developments in the United States in the manufacture of dry dog foods, some of them blown up, as in the case of certain human breakfast foods by use of the Wenger machine. Sales of such products were now of the same, or even higher order, in the United States, as canned dog foods. It seemed likely that such foods would shortly come on to the market in this country. At the Unit, some of the American brands had been fed, but it was too early to say whether or not they had the same limitations as canned foods, and there were not yet sufficient supplies to feed as the sole diet over long periods. However, when in the United States last year, he had seen many experimental dog colonies that were so fed with, it was claimed, good results. Again, he would appreciate a comment from Mr. Harms upon possible further developments in this country.

Dr. Booth had drawn attention to the lack of information on the dog's water requirement. Kleitman in 1927 recorded that the water requirement of dogs varied from day to day and was not directly related to bodyweight, diet or temperature of the environment. He found that there was a marked decrease in water intake during starvation, which he attributed, at least in part, to a gradual deterioration of the salivary conditioned reflex. Some years ago, Tarbin recorded that dogs consumed larger volumes of water at higher environmental temperatures, but as a result of more frequent drinks rather than by any change in the amount of water taken at each drink. He stated that a given dog appeared to favour a characteristic size of drink and that that was not markedly affected by total food or water intake. At a previous Congress, he himself had pointed out that adult dogs with chronic interstitial nephritis did sometimes consume very long single drinks. At that same Congress, he was dealing primarily with the behaviour of that species, a subject to which he would not now return except to emphasise the importance of behavioural factors in healthy alimentation and in training.

Finally, he had been most interested in Dr. Booth's reference to prescription diets and would welcome further details. His colleagues had carried out a series of observations on the prescription diets that had been available to veterinary surgeons in this country during the past few years, and their results were at present being prepared for publication.

Dr. Booth and Mr. Harms had thrown up many other topics of genuine interest, and he hoped that they would be rewarded by a lively and informative discussion. Tribute should be paid to the value of the research, mainly on cat nutrition but with considerable bearing on today's problems, that their organisation had supported at the Royal Free Hospital School of Medicine.

References

ARNOLD & ELVEHJEM, C. A. (1939). *J. Food Research*, **4**, 547.

BETTS, A. O. & LUKE, D. (1961). *Vet. Rec.* **73**, 283.

CONSUMERS' ASSOCIATION (1960). *Which?, November*, p.244.
COWGILL, G. R., ROSENBERG, H. A. & ROGOFF, J. (1931). *J. biol. Chem.* **90**, 589.
GREIG, J. R. (1953). *Brit. vet. J.*, **109**, 14.
HARMS, J. & SCOTT, Patricia P. (1956). *J. Sci. Fd. Agric.*, **7**, 477.
HEMSLEY, C. A. (1955). *Vet. Rec.* **67**, 790.
KLEITMAN, (1927). *J. biol. Chem.* **80**, 336.
MCCAY, C. M. (1949). *Nutrition of the Dog*, 2nd Ed. New York, Compstock.
TARBIN, E. J. (1955). *Amer. J. Physiol.* **182**, 377.
TAYLOR, R. J. F., WORDEN, A. N. & WATERHOUSE, C. E. (1959). *Brit. J. Nutrit.* **13**, 1.

The General Discussion

The Chairman had a very simple though practical question to ask, which was probably in the minds of all those in general practice. The inference was that, on occasions, the canned dog and cat foods might not be an adequate diet. He would like a practical guide from either of the speakers as to what those in general practice should advise owners who were feeding a complete canned food to their pets.

Mr. Harms said that, being a member of an industrial firm, he was a little restricted in some of the replies he might give to the questions asked but would try to be as open and frank as he could on the subject.

Naturally, canned foods as such suffered, to some extent, from the thinking prevalent 20 years ago with human canned foods: that they were not the same thing as the fresh article. There was no doubt, as Dr. Worden had said, that some damage did occur during processing, more in the case of a dried food than a canned food. His firm endeavoured to keep the temperatures as low as possible and the time of heating as short as possible, consistent with adequate sterilisation. Vitamin tests were carried out consistently on the finished products, particularly in relation to vitamin B_1. At present two types of canned foods for dogs were produced. They produced mixed diets containing animal protein together with carbohydrate, cereal and fat, and also all-meat diets: the latter largely in response to public demand for a meat type food.

As far as the complete diets, as they called them, were concerned, which contained fat, carbohydrate and protein, it was fair to say that they still formed a very good, adequate base for a dog's diet. There must obviously be differences in individual needs, particularly in relation to carbohydrate: it was uneconomic, of course, to put large quantities of carbohydrate in a can.

Some rather *ad hoc* experimental work had been carried out on feeding animals solely on canned foods. The dogs used were free-running and therefore taking a large amount of exercise, and they consumed on average an ounce per pound bodyweight of a diet which was of the "complete diet" type. The experiment had been running for 2 generations and at 1 year old, one pair of the first generation had bred. As far as they could see and their veterinary advisers could tell them, the dogs were in perfect condition. They hoped to continue the experiment to see how many generations could be bred, feeding solely a canned diet. It was only right and proper to fortify at the stress periods and milk had been allowed *ad lib* to the mother while feeding her puppies. Milk was also allowed *ad lib* to the puppies for the first week after weaning, and supplementation with Vitamins A and D was given twice a week for 2 weeks after weaning. Otherwise feeding was solely with the canned diet. The experiment had been going for too short a time for any fantastic claims to be made but it seemed that they were fairly safe in recommending this diet as a sole diet for a normal dog. Judging by the known standards for vitamin levels (and those were rather nebulous in many ways, particularly as far as the normal animal was concerned, since most work had been done on animals artificially depleted or suffering from a vitamin deficiency), their levels in the canned product were, by and large, adequate for most animals.

Miss W. M. Brancker (Sutton Coldfield) said that the subject was a very important one and she was very glad that it had been brought forward at the Congress.

She had encouraged dog-owners to feed their dogs on meat during the war when it was the easiest obtainable food, and had found that the dogs throve on it. Then, a few years ago, she had read an article which said that dogs should not have an excessive proportion of meat as it was both wasteful and harmful. She had altered her advice accordingly but before doing so had tested the urine of some of the dogs that were on an entirely meat diet. These urines contained no evidence of excess protein intake. She had now reverted to her advice that most dogs over 7 or 8 years should go on to an entirely meat diet. She quite realised that the average dog-owner, if told to put his dog on an entirely meat diet, also added the odd scrap from the table. There were a certain number of dogs, however, that she knew to be on an entirely meat diet and these dogs appeared to thrive and live to ripe old age. When they were put on to a mixed diet, they did not do so well. She had always been interested in this point and would like comments from the speakers.

She also remarked that if 1 oz. of meat per bodyweight was recommended in a mixed diet, that would be a tremendous intake for a 60 lb. dog.

Mr. Harms replied that the dogs were running free in a concreted compound and taking a large amount of exercise. The particular experiment which had been reported was carried out with dogs weighing about 20 lb. and had arisen due to the pregnancy of a "Scottie" which had been taking part in a feeding trial where the sole diet had been canned food. She had been fed on this for 6 weeks prior to the birth of a litter consisting of 5 females and 1 male. She fed the whole litter while being fed on the canned diet supplemented with milk. The puppies were genetically a mixed batch but kept in good condition throughout: pictures of them were available at the company's stand in the Exhibition. Two more puppies of this litter had now been mated.

Other experimental work had shown that the quantity of canned food fed could be reduced to 3/8 oz. per pound bodyweight if supplemented with cereal. In the main experiment, however, it was their concern to show the effect of feeding solely a canned diet. Nutritionally it was not an ideal experiment because the company had no animal research laboratories and it was only possible to carry out a simple feeding trial in another institute. However, a careful check on bodyweight and condition had been kept and this gives a good indication of the feeding value of the diet.

Dr. R. F. H. Distav (Antwerp) asked what should be done with a dog that had chronic nephritis and refused to drink. Should they be given some sugar to make them thirsty?

Mr. Worden replied that a better plan would be to feed a food which contained the water built in and make such a dog eat rather than drink water, because that was a reflex they had to learn again.

Mr. T. W. Groves (Wilmslow) said that his only connexion with dog nutrition was that from time to time he was asked by the company for which he worked to advise on the diet of experimental dogs used for chronic toxicity tests. For the purpose of examining the toxicity of some substances used in the treatment of man, it was necessary to carry out toxicity experiments on dogs which might last 6 months or even 2 years. Some of the substances had unpleasant flavours. It was difficult to get dogs to eat them. It was obviously far more convenient to incorporate the substances in the food than to dose dogs by hand daily with tablets. Were there any foods or flavours known to the speakers that would be accepted by dogs and tended to mask the often bitter flavours?

Mr. Worden replied that he knew of no such substances and that the problem had been overcome, in his case, by intubation. Fifty dogs could be done in no time.

Mr. Harms said that the danger of putting those unpleasant materials in the diet was that the dog could go off the normal diet afterwards, and then one had another problem to one's hands.

Mr. D. G. Earnshaw (Dublin) referred to the figure of

1 oz. per pound bodyweight that was mentioned as a basis for assessing daily food intake. That was a figure in fairly wide usage. He himself had used it making adjustments for factors such as pregnancy, puppyhood, obesity, etc., and had advised that two-thirds of the daily intake should be meat (including offal in this term and not just muscle meat). Could the speakers give a better basis for advising pet owners on this point?

Mr. Harms said that it depended on the food that was going to be recommended. In the experiment he had mentioned, it was found that that was the quantity of a composite canned diet which satisfied the dog's needs. The actual quantities in practice would depend very much on the ratio of the various nutrients in the diet. He had no experience of feeding large numbers of dogs except by noticing what went on in experiments. Most dogs were fed far too much protein. He was referring to normal dogs. People ate too much protein and the dog did the same. It was not necessary and it was expensive.

Dr. Distav said that the breed made a difference. The cocker fattened more easily.

Mr. Harms said that it was the calorie intake that needed varying more than anything else, depending on the type and activity of dog, whereas the protein intake had to be related to bodyweight. It was difficult to give exact advice because so many different types of food were on the market. All-meat food could be mixed with cereal. As far as his company was concerned, an attempt was made to balance out everything except the carbohydrate. Some foods had to be advertised by implication as free from carbohydrate. It was ensured that the vitamin B_1 content was up to the level necessary and that the calcium-phosphorus ratio was correct by adding ground green bone. There was no doubt that this ratio was more important than vitamin D in the diet.

Mr. F. A. Edgson (Earley, Reading) asked if the speakers had any views on the frequency of food as fed to animals, particularly dogs. The general impression was that a dog should receive one meal a day. Was the digestibility of the food increased by increasing the feeds per day?

On the matter of palatability, if it was of any help, he had never yet found a dog which disliked fresh horse droppings!

Mr. K. N. Burns (Weybridge) was interested in Mr. Worden's reference to increased fat intake in cold conditions: was this higher intake due to increased metabolism or to an increase in depot fat, or to a combination of the two?

Captain R. A. Currer-Briggs (R.A.V.C.) said that he had been in Kenya for 3 years and was *en route* for Hong Kong.

He was intrigued by Miss Brancker's comments on the feeding of dogs with a completely full meat diet. On a number of occasions in Kenya, where the atmosphere was drier than in this country, dogs had been brought to him with dry skins and staring coats, and nearly every time those dogs had been on 2 lb. or 1¼ lb. of meat with nothing else in their diet that the owners would admit. He usually found that by cutting down the meat to about 1 lb. or slightly less and by increasing the carbohydrate part of the diet, either with biscuits or something similar, and at the same time using some Marmite or other yeast preparations to make sure the animal was getting plenty of vitamin B, the condition immediately improved and the animal usually put on weight and gained condition at great speed.

With reference to the possibility of the use of prescription diets, in tropical Africa one was constantly up against anaemia through tick-borne diseases, and suitable foods such as liver or spleen, which are rich in iron, were not always readily available. Therefore, pills or injections containing iron and other minerals had to be relied upon. Under the circumstances it would be very useful, although he appreciated that the market was extraordinarily small, if there were various kinds of diets which could be produced for the veterinary surgeon to hand to his client, confident in the knowledge that the animal was receiving a suitable diet for the condition under treatment.

The Replies

Mr. Worden, summing up, referred to the question of damage to canned foods which had been raised by himself, Mr. Harms, the Chairman and Miss Brancker. He agreed that the dogs that were thriving and breeding on a canned food diet, supplemented with milk or other foods at stress periods, were in somewhat different circumstances to experimental dogs and that steps could be--and clearly were being--taken by manufacturers to correct vitamin levels. Minerals could also be controlled successfully. The main question was, however, one of protein damage and he would urge that that be tackled further.

Miss Brancker had referred to the successful use of an all-meat diet in somewhat older dogs. If an all-meat diet implied the feeding merely or mainly of lean or muscle, then the calcium-phosphorus imbalance referred to by Dr. Booth would definitely obtain. While that would not show up rapidly in older animals, it seemed unwise to continue without making necessary correction. It was very simple in practice to make good the deficiency--merely dusting the meat with about 1 per cent. or so of calcium carbonate or calcium lactate would help considerably. That was now being employed at Whipsnade and elsewhere to help to overcome the same difficulty in the feeding of captive wild carnivores. In her oft-quoted paper published in 1941, Agnes Fay Morgan had provided a graphic description of the feeding habits of the wild carnivore and the inadequacy by comparison of a diet of lean meat.

In reply to Dr. Distav, he hoped that the forthcoming paper by his colleagues would help to deal with some of his questions relating to existing prescription diets.

It was clear that Dr. Groves had much the same problems as himself and his colleagues at Huntingdon. The short answer to the question of whether or not there existed a material that would make diets, with additives, unfailingly acceptable to dogs was "no." At Huntingdon, they did not rely upon additions of test drugs and other materials to the food but, whenever possible, administered them by intubation. There were many advantages in that, including absence of interaction between food and test material, greater exactitude of dose, and avoidance of non-specific inappetence. Moreover, it was a simple routine to pass the stomach tube, and dogs readily learned to co-operate. Also, the various authorities who had been approached, including the United States Food and Drug Administration, had approved of that method of administration when put up as part of the experimental scheme.

The amount of the food allowance mentioned by Mr. Earnshaw depended very greatly upon water content. Fresh lean meat and canned products usually contained of the order of 60 to 70 per cent. moisture, whereas biscuits might have only 4 to 8 per cent. Dr. Scott and her colleagues at the Royal Free Hospital School of Medicine had shown that the daily dry-matter requirement of cats on a balanced diet ranged from about 2 to 4 oz., the total intake (wet weight basis) being a corresponding multiple of that.

In reply to Mr. Edgson, he would say that while there were many factors involved, there would generally be somewhat better utilisation of the food in two or more meals than in one large meal. The possible utilisation of horse-droppings as an attractant he would leave to Mr. Harms to deal with, but one must not forget the sparrows!

There seemed little doubt that, of the 2 possibilities raised by Mr. Burns, metabolic factors were involved in the greater utilisation of fat by dogs in Arctic and Antarctic conditions. If he might refer again to the studies that prefaced the British Trans-Antarctic Expedition, the performance of the working sledge dogs had been most interesting: if restricted to a diet consisting solely of pemmican, the dogs were able to continue in good fettle for a limited period only and developed several signs, and also biochemical evidence of deficiency. A single meal of fresh seal was, however, sufficient to revive them, and to sustain them for a further period of up to about 12 days or so on pemmican.

It would be very helpful to those concerned to have available prescription diets for such conditions as anaemia in dogs that had survived hookworm infestation, as requested

Protection Against Canine Virus Diseases in Great Britain*

BY

W. MANSI

Weybridge

SUMMARY.—Protection against canine distemper complex and canine virus hepatitis should be carried out at the same time. No interference between the immunological response of the 2 viruses, when administered simultaneously, was noted based on clinical observations and serological examinations.

The method of protection to be recommended depends on the clinical circumstances involved.

Immune response to vaccination with live virus vaccine is of more practical value than the use of dead virus vaccines.

Current preparations and methods of protection are discussed.

The incidence of both viral infections could be greatly reduced only by mass immunisation.

* Paper presented to the Annual Congress of the British Veterinary Association in Oxford on Monday, September 4th, 1961.

Introduction

THE 2 main canine virus diseases of significance in this country are the canine distemper complex and canine virus hepatitis. Up to the present time there is not enough evidence to indicate the existence of other viral infections which play an important part, and therefore, protection against these 2 viral infections only will be considered.

In order to understand this subject 3 basic points must be considered: the disease involved, the immunising agent, and the animal to be protected.

The Disease

Clinical manifestations of these 2 infections have been the subject of discussion for a great many years. No doubt you are aware of the complexity of the clinical symptoms associated with the 2 diseases.

It is accepted that the canine distemper virus is

Some Aspects of Dog Nutrition.—*Concluded.*

by Captain Currer-Briggs, but he felt sure that Mr. Harms would endorse the economic difficulties of producing a range of prescription diets even for the U.K. market.

Mr. Harms summing up said that it was particularly interesting to note how everyone was coming to realise that there were certain basic problems in dog nutrition. In particular he thought vitamin B_1, Ca:P ratio, heat damage during processing and the proper balance of nutrients were of considerable practical importance. More experimental work was needed on these facets of dog nutrition and he would make a plea to those carrying out experimental work in the nutritional field that they should always state the water content of their diets. It was often difficult to know whether authors were referring to dry or wet weight when certain nutrients were fed.

They had been fortunate in having Mr. Worden to open the discussion and, in his usual facile style, he had given a wide range of experimental matter on dogs and their feeding. He had also asked a number of questions to which he would try to give the answers.

The question of thiamine had been covered fairly adequately. The extent of protein damage was very important. A large amount of experimental work was required to nail it down. The work done by Dr. Scott and himself on dried foods showed that there was damage particularly when dried foods were heated above 120° C. Whether that applied to canned food or not, he was not certain. His company had not done very much work in terms of the available lysine content of canned diets.

A considerable number of surveys in the field had been undertaken to try to determine the condition of animals which were being fed canned foods. There was very little evidence of serious deficiencies as far as those foods were concerned. The veterinary profession dealt with a large number of animals and he knew they had reservations on canned diets. He would like to find out the true nature of these reservations. It was only by seeing the effect of feeding the diets in the field that it could really be discovered whether they were truly adequate.

With regard to expanded foods, as Mr. Worden and he had both said, in America they were forming a very large proportion of the prepared foods fed to dogs. The firms who were manufacturing those foods claimed to have carried out experimental work and maintained that they were adequate for animals. Whether those claims were justified or not, he did not know, but one always had more reservations about a dried food than of a canned food in terms of a complete diet.

Dr. Distav pointed out that some dogs did not digest dried food.

Mr. Harms said that that could be discussed after the meeting.

Mr. Worden had covered the all-meat diets very adequately. There was definite evidence that all-meat diets were very dangerous in terms of the calcium-phosphorus balance. A case of thyroid enlargement had been reported on those diets. It was certainly a symptom. He had come across recently a case of a Pekingese fed an all-meat diet which had a very serious goitrous condition.

On prescription diets, there were some available already in this country and many such diets in canned form were available in America, but, judging by those canned diets he had seen, they did not always fulfil the claims made and the formulation was not, in his opinion, always correct for the various types of nutritional syndrome they claimed to treat. It was most important, if canned prescription diets became generally available (and his firm were doing work on the problem), that they should be absolutely right for the job they were intended to do. Otherwise, they would fall into disrepute.

Mr. Worden pointed out that Mr. Harms had himself published work on rats. The answer was that obviously it could not be applied in terms of overall dietary feeding but the rats could be used as an indication of a nutritional factor.

The Chairman thanked the speakers for their most interesting and stimulating addresses. The discussion had been a good one. It was a real step forward in their knowledge of dog nutrition. When the discussion was published, it would be something that every person in small-animal practice should read, mark, learn and perhaps "digest."

an epitheliotropic virus capable of invading various cell-systems of this origin, producing various visceral and nervous syndromes. It is also now accepted that the so-called hard-pad syndrome, which some years ago was thought to be a virus of separate aetiological, antigenic and immunological entity from that of the Laidlaw-Dunkin/Carré virus, is in fact identical with that virus.

The isolation of the Glasgow S123 strain and its behaviour in experimental animals, ferrets and dogs (Mansi, 1951) made it possible to reproduce a variety of clinical syndromes, including those of the so-called "hard-pad disease," depending on the route of introducing the virus into the susceptible host. The clinical picture in partially immunised animals can also lead to confusion. While a fully susceptible animal will produce what we may call the typical clinical picture, the solidly immune animal will produce no clinical manifestations if challenged with the same amount of virulent virus introduced by the same route as to the susceptible animal. In between these 2 conditions the partially immune animal may produce merely a thermal reaction, mild conjunctivitis and nasal catarrh, mild diarrhoea and nervous fits of an intermittent and progressive nature. In many cases all these symptoms subside and the animal recovers. Mortality in partially immune animals is not high.

Canine virus hepatitis is widespread in this country as well as in many other parts of the world. The disease is of a low mortality rate, in uncomplicated cases. The history and the *post-mortem* lesions in many cases are quite significant in fatal cases. The subacute infection is characterised by severe to mild tonsillitis of non-bacterial origin, enlargement of lymph nodes, and in many instances the appearance of a unilateral corneal opacity. Mortality from this type of infection is rare. The inapparent infection which represents the largest group is, indeed, non-fatal.

Recently evidence has been shown that *post-mortem* lesions in the acute fatal canine virus hepatitis can be confused with those produced by acute fatal haemolytic *Escherichia coli* septicaemia or toxaemia. Careful examination of the wall of the oedematous gall-bladder will show that in hepatitis the oedema is diffuse and solid, but in *E. coli* infection the wall is infiltrated by air bubbles. However, laboratory examination will differentiate the two conditions.

Laboratory Diagnosis

Fig. 1 is a diagrammatic illustration of the possible courses of viral infection—A: death, and B: recovery. In either course the period of incubation may coincide with phase 1 (P1) when no signs of clinical infection are present (neither antigen nor antibody is demonstrable by the gel diffusion precipitin test or by any available serological test in any of the tissues).

The incubation period is followed by the viraemic phase (P2) which coincides with the period of premonitory symptoms and the peak of thermal reaction. Virus (V) can be isolated from the blood and tissues of affected animals. This phase may be as short as a few hours, as in the case of canine virus hepatitis, or a few days, as in the case of the canine distemper complex. If, however, animals are killed at this stage, the precipitin and complement-fixing antigen can be demonstrated in only a small number of affected animals. Neither complement-fixing nor precipitating antibodies are present.

It seems probable that if material is collected from infected animals at the third phase (Fig. 1, P3) of disease (a stage which is usually characterised by clinical illness, whether the symptoms are typical or atypical) an antigen as indicated by the complement fixation or gel diffusion precipitin test can be demonstrated in the tissue or set of tissues, varying according to the virus, the route of infection, species affected and the severity of the condition. No antibodies are demonstrable at this stage.

In the early stage of recovery, phase 4 (Fig. 1, P4) antibodies appear in the serum and in some tissues,

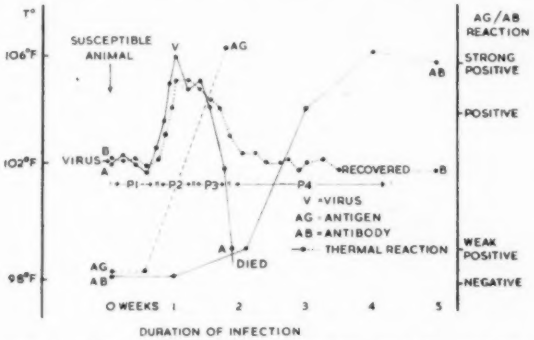


FIG. 1.—The demonstration of antigen and/or antibody during the course of infection.

FIG. 1.—Explanatory Note.

This is a diagram showing the possibility of demonstration of Antigen (AG) and/or Antibody (AB) during the course of a viral infection.

"A" and "B" represent two susceptible animals which were inoculated with virus.

"A" refers to the temperature curve of an animal which died. It will be noted that viable virus (V) can be isolated with ease at the height of the thermal reaction from the blood. This coincided with gradual appearance of antigen (phase 2 (P2)). Antigen reached its highest concentration (strong positive) by the time of death of the animal in phase 3 (P3).

"B" refers to the temperature curve of an animal which recovered. It will be noted that antibodies were demonstrable (weak positive) towards the end of the second week, reaching a maximum concentration (strong positive) by the end of the fourth week.

This is, in fact, a diagram of a working plan as to when to obtain satisfactory results when testing tissues for the presence of antigen or serum for the presence of antibodies. This can be summarised as follows:—

		Demonstrable	
		Antigen	Antibody
P1: phase 1: Incubation period	=	Negative	Negative
P2: phase 2: Viraemic period	=	Weak positive	Negative
P3: phase 3: Clinical period	=	Strong Positive or Positive	Weak Positive
P4: phase 4: Convalescence	=	Weak Positive	Strong Positive or Positive

gradually replacing the remaining traces of viral antigen.

Complement-fixing and precipitating antibodies do not usually remain demonstrable in the blood for very long after recovery. Neutralising antibodies, on the other hand, persist for longer periods. Their presence would not be associated with a recent infection and thus it will not be of much assistance in confirming a recent outbreak in a kennel, let alone in the suspected animal.

In a recent outbreak in a kennel, the demonstration of complement-fixing or precipitating antibodies in healthy in-contact dogs is of much greater help in confirming the presence of such infection.

The Protecting Agents

1. Passive Protection

The method is very well known and there are various examples which are in use in man and animals. It consists of inoculating already prepared antibodies (protecting, neutralising, complement-fixing and precipitating antibodies) from the donor animals to the recipient. Such antibodies will have the power of inhibiting any effect of an intruding virus or virus circulating in the blood. Such property will gradually pass off—hence the term passive protection. The use of such serum would be of benefit under the following conditions:—

(a) To protect a newly purchased puppy, which is still under the age at which it could benefit from active immunisation.

(b) To protect an animal, clinically healthy, but in contact with a confirmed case.

(c) In a suspected viral infection—early stage Fig. 1, P2). Owing to the confusion of the clinical picture at this stage the inoculation of serum intravenously would be of great value in producing a good response.

The use of a mixture of bacterial and viral mixed canine anti-serum would be of more value, as this would have the advantage of inhibiting bacterial secondaries, should they exist. The inclusion of anti-*E. coli* antibodies would be beneficial.

It is possible to concentrate antibodies in serum by various methods, among which are freeze-drying, and repeated freezing and thawing techniques to enable the inoculation of a large amount in a small volume.

The use of interferon, and of other anti-viral agents apart from the antibodies procedure, is still in the early stage.

2. Active Protection

For a number of years the subject of protecting man and animals against viral infections has been under continuous review. The procedure has changed according to recent knowledge and the results of continuous field trials, on small and large scales, of mass immunisation.

There are 2 main methods: the first is the use of killed/inactivated vaccines, and the second is the use of live vaccines.

In a broad sense it is important to use what is best according to the circumstances.

(a) *The Inactivated Vaccines*

These are prepared from the tissues of the original host, collected after inoculation of susceptible animals with the fully virulent/lethal virus. Animals are sacrificed and the tissues of choice are collected, emulsified in glycerol saline, and treated with chemicals, *e.g.* formalin, to render the virus inactive, *e.g.* Laidlaw-Dunkin distemper vaccine. In recent years it has been possible to propagate viruses in tissue culture. The canine hepatitis virus can multiply easily in the kidney cells of dogs, pigs and ferrets. The cultivated virus is then inactivated by chemicals or similar substances.

This type of vaccine when inoculated into animals produces no ill effect. Antibody response is related to the amount of antigen present in the vaccine dose. The duration of immunity is limited and hence the necessity of administering a second dose. You are aware of the poliomyelitis vaccine in man which is at present given in at least 3 doses because of the short duration of immunity provided by 1 or 2 doses only. There are various examples on these lines.

The use of tissue-killed vaccine for protection against canine distemper has been discontinued in this country for several years, since the introduction of the live egg-adapted distemper vaccine.

Tissue culture hepatitis killed vaccine has been in use since September, 1959. There are mixed feelings about the results obtained. The vaccine is prepared in tissue culture of virulent virus cultivated on dog kidney cells. Kidneys are collected from apparently healthy animals. The kidney cortex is removed, minced, and treated with trypsin. The suspension is then diluted with growth medium and incubated. When cell growth is evident on the surface of the glass, the virus is inoculated into the medium and re-incubated at 37° C. for 6 days. Propagation of the virus is recognised by its cytopathic effect. This is easily determined by microscopic examination. The whole culture is harvested and filtered and then treated with formalin. Other methods of inactivation of the virus may be employed without necessarily using chemicals.

(b) *The Live-virus Vaccines*

The use of egg-adapted distemper vaccine was initiated after the successful propagation of the virulent virus on the chorioallantoic membrane of the developing chick embryo. After serial passages the virus has lost its ability to produce a clinical infection while still retaining its ability to induce an active immunisation. The vaccine is prepared from infected membranes, and in some preparations the whole embryonic contents are used. These are emulsified and freeze-dried. In some preparations the final vaccine is sealed under vacuum, in others the vacuum is replaced by nitrogen, and in yet other preparations it is sealed with neither vacuum nor nitrogen.

Under this group of live-virus vaccines falls the method of attenuation and the route of introduction.

The attenuation of the canine distemper virus has been achieved by serial passage of the virulent distemper virus on the developing chick embryo.

After several generations the virus begins to lose its virulence to invade and destroy the original host's cells (dog and ferret) but still retains its ability to induce active immunity.

When this stage of attenuation is reached (judging by the virulence tests in ferrets) the harvested membranes are used for vaccine preparation. When the virus is inoculated on the chorioallantoic membrane of a 6-day-old embryo, white pock-like lesions appear and become prominent on the sixth day after inoculation. In certain strains of eggs the membranes are markedly oedematous. The membranes are then harvested, checked for freedom from bacteria and fungi, and then pooled, emulsified and distributed into vials. These are freeze-dried under vacuum. When the process is completed samples of the vaccine are subjected to the following:—

(i) sterility test : for the freedom from bacteria and fungi;

(ii) toxicity test : material inoculated into mice, guinea-pigs and ferrets. The vaccine should not produce any ill effect in any of the animals inoculated;

(iii) viability test : titration of the vaccine on the chorioallantoic membranes. The vaccine virus should produce pock lesions in a dilution of 1 : 1,000;

(iv) potency test : 3 ferrets are inoculated intraperitoneally with the vaccine, at a dilution of 1 : 100, 1 : 1,000 and 1 : 10,000 respectively. The 3 ferrets are challenged 1 week after inoculation with a known virulent strain together with a susceptible control. The control ferret must exhibit the typical lesions of canine distemper, and the ferrets which received the vaccine doses of 1 : 100 and 1 : 1,000 must survive. The ferret which has received the 1 : 10,000 dilution usually survives as well.

There are a number of vaccines prepared on these lines in this country as well as imported vaccines. In principle they are of the same origin, with the exception of that prepared from the Glasgow S123 strain, derived from the South African or American strains. The method of preparation may differ from one laboratory to another.

The use of tissue culture-attenuated canine distemper vaccine is still to be considered for practical application in this country.

Live unattenuated virus instilled into the conjunctival sac of susceptible dogs produces an eyelid reaction—non-purulent oedematous swelling of the nictitating membrane—4 to 6 days after instillation. The cervical lymph nodes may be affected. However, the results of experimental and field trials have shown that this reaction may be severe in less than 10 per cent. of highly susceptible animals. This varies even within the same litter.

The vaccine is prepared from freeze-dried liver collected from experimentally infected animals which were destroyed at the height of the reaction or *in extremis*.

Live attenuated canine virus hepatitis vaccine has been achieved by serial passage of a fully virulent strain on tissue culture of pig kidney cells. After serial passages, the virus has lost its ability to reproduce a clinical disease, the final preparation is freeze-dried under vacuum.

Attenuation has also been obtained by propagation of the hepatitis virus on ferret kidney cells.

A further method of attenuation was the primary multiplication of the canine hepatitis virus in tissue culture followed by inoculation into the yolk sac of a chick embryo.

The use of dual live attenuated canine distemper vaccine administered by inoculation and the instillation of the live canine virus hepatitis vaccine into the conjunctival sac was first investigated in 1952. The result of this method was reported by Mansi (1956). In 1959 presentation of the hepatitis vaccine in the form of freeze-dried material suspended in ointment base was made available. In 1960 a further modification was made, to process this ointment vaccine in the form of a gelatine capsule. Administration of the latter vaccine has reduced the local eyelid reaction and except by careful examination of the nictitating membrane or the cervical lymph node on the side in which the vaccine was instilled in the conjunctival sac, the reaction will not be observed.

The mixture of the 2 live attenuated virus vaccines can be pooled after being prepared separately and freeze-dried under vacuum.

The Animal

Age for Administration

Avianised Distemper Vaccine

There is wide controversy concerning the actual age for vaccination, especially in the young puppy.

Preparation "A" is primarily intended for the active immunisation of dogs at the age of 9 weeks or as soon as possible thereafter. Puppies may be inoculated from the age of 6 weeks but, since transferred maternal immunity is liable to interfere with active immunisation, those under the age of 9 weeks should always be given a second injection when they reach the age of 9 weeks or as soon as possible thereafter.

Preparation "B." The recommended age for primary vaccination with canine distemper vaccine is 8 to 10 weeks—preferably 10 weeks.

Preparation "C" recommends 9 weeks.

Preparation "D" recommends a minimum of 10 weeks.

Canine Virus Hepatitis Vaccine

Preparation "A" is primarily intended for the active immunisation of puppies between the ages of 3 and 9 weeks; it is also suitable for older dogs.

Preparation "B" recommends the age of 8 to 10 weeks.

Preparation "C." It is advisable to give the first inoculation of inactivated vaccine at 9 weeks or as soon after as possible. In kennels where this disease is endemic first inoculation can be given at 4 to 5 weeks. A second dose is given 2 weeks later.

Preparation "D" recommends that puppies born to a previously vaccinated dam should be vaccinated

at 10 to 12 weeks of age. Puppies born to an unprotected dam may be vaccinated as early as 8 weeks.

Inoculation of Vaccine

Preparation "A" recommends boiling of syringes and avoidance of chemical sterilisation.

Preparation "B" gives no specific instructions.

Preparation "C" gives no specific instructions.

Preparation "D" provides a ready sterile disposable syringe and needle.

Discussion

For all practical purposes the 2 virus diseases, canine distemper complex and canine virus hepatitis should be considered in any protection procedure as they affect most dogs in early life.

The incidence of active infection in puppies from birth up to 12 weeks of age is very low, especially between birth and 9 weeks. There is also the problem of passive maternal immunity and of the insusceptibility of the young puppies within this age group, under natural conditions, to infection. These factors have made it essential that if a puppy receives a dose of live or killed vaccine at the age of 4 to 6 weeks it should receive a further dose on reaching 9 weeks or soon after. Protective levels of antibody are not produced by the first inoculation (Keeble *et al.*, 1961).

It is found that if the chance of cross infection with either virus may occur, the puppy in question should receive a dose of a potent combined distemper and hepatitis serum at the age of 8 weeks and then be vaccinated during the eleventh week with live dual vaccine. Such procedure has proved to be satisfactory and practical even in the most difficult circumstances, *e.g.* in kennels or pet-shops where isolation is not feasible.

This procedure can be applied to dogs of all other ages when the history is suspicious of their having been in contact with an active infection. Such application would save time pending the result of examination of a blood sample, and moreover the cost of the serum will possibly be about the same as for the examination.

A clinically healthy animal with a known history of freedom from current infections will present no such problem. The use of a dual canine distemper egg-adapted vaccine together with live attenuated canine virus hepatitis vaccine (the latter in the form of tissue-culture virus propagated in pig-kidney cells or ferret-kidney cells or chick embryo), administered by inoculation, should produce a satisfactory state of protection without giving rise to any significant clinical reaction. The use of a live hepatitis virus in the form of an oculentum will induce a state of protection within 24 hours of instillation into the conjunctival sac. The latest available preparation has reduced the incidence of marked eyelid reaction without interfering with the immune response. The use of this oculentum simultaneously with the combined canine distemper and canine virus hepatitis egg-adapted vaccine has produced satisfactory results. The immune response after live vaccines is usually superior to that produced by killed vaccines.

There has been much controversy as to the interference between the immune response to canine distemper complex and canine virus hepatitis (Howell, 1961). It has also been suggested that there is strong competition between the 2 viruses. Early experimental work (Mansi, 1955, 1956, 1957, 1959) has indicated the opposite. This has been confirmed by Piercy and Sellars (1960).

Once more the safety of the vaccines used has been much discussed. It is fortunate that there is not much argument about the harmless effect of the attenuated canine distemper egg-adapted virus, although in the early years of its use it also was under fire; the use of immune distemper serum was then recommended by certain laboratories in the U.S.A. Others feared the regaining of virulence after inoculation into dogs.

The canine hepatitis vaccines have a great deal to offer in this discussion. Killed vaccines are safe, but as mentioned before one dose hardly stimulates immunity. A second dose is essential and a third dose recommended. Possibly annual vaccination would be adequate, but unfortunately there is the financial aspect to consider as well as the inconvenience, because administration of live vaccines, *i.e.* by inoculation or by instillation, provides a greatly superior immunity for far less effort. It has been argued that live vaccines produce nephritis. This has not been substantiated. Animals killed from 21 days and onwards after vaccination showed no antigen in their kidneys. Immunity is complete, with maximum antibody production and solid protection against further infection. During the early stage of these experiments the tissues of a number of dogs were examined and no lesions were present.

The problem of spreading infection has arisen. Early work showed that when susceptible dogs were placed in direct contact with dogs which had been previously vaccinated—in some instances direct contact lasted for one month—a fortnight after the latter were vaccinated, the contact dogs were found to be susceptible on challenge (Mansi, 1953). This method of immunisation has been in 2 stages, the first (experimental) from 1952 to 1959, and the second from July, 1959, onwards. During this period administration of canine hepatitis vaccine by the method described did not produce or contribute towards cross infection in in-contact animals. A recommendation is always given to the effect that it would be advisable to vaccinate all susceptible dogs on the premises at the same time.

Unfortunate circumstances may occur soon after vaccination in what appeared to be a clinically healthy animal, like the development of visceral symptoms of canine distemper or subacute canine virus hepatitis. This would be the result of inoculation during an incubation period and the reason can be explained to the dog's owner. In other cases the development of nervous complications may occur any time after vaccination up to 42 days; once more the animal has been inoculated during the incubation period. These are not considered breakdowns.

On the other hand, if visceral or nervous symptoms of the distemper complex or canine virus hepatitis appear 6 months or more after vaccination, then

this is to be considered as a breakdown and the vaccine has failed to protect the recipient animal. Various questions may arise as to the type of vaccine used—live or killed, the age at which the animal was vaccinated, whether the syringes may have been sterilised by chemicals (this question would not arise with every preparation), individual susceptibility, exposure of vaccine to adverse conditions; in cases where the breakdown occurred a year or more after primary vaccination the question would be whether the animal was in isolation from other dogs.

It must also be emphasised that in a distemper-immune dog inoculated intravenously with fully virulent virus, although only a mild thermal reaction may occur, the virus can be recovered from its blood 24 to 48 hours after inoculation but not after 4, 7, 12 or 96 hours.

References

FIELDSTEEL, A. H., & EMERY, J. B. (1954). *Proc. Soc. exp. Biol., N.Y.* **86**. 819.

HAIG, D. A. (1948). *Onderstepoort J. vet. Sci.* **23**. 149.

HOWELL, D. G. (1961). *Vet. Rec.* **73**. 46.

KEEBLE, S. A., BAKER, L. A., & HOWELL, D. G. (1961). *Ibid.* **73**. 286.

MANSI, W. (1951). *Brit. vet. J.* **107**. 214.

———. (1953). *J. comp. Path.* **63**. 236.

———. (1955). *Ibid.* **65**. 291.

———. (1956). *Ibid.* **66** 137.

———. (1957). *Ibid.* **67**. 297.

———. (1959). Thesis, University of Reading (Ph.D.).

PIERCY, S. E., & SELLARS, R. E. (1960). *Res. vet. Sci.* **1**. 84.

The Speaker's Introduction

The Chairman, Mr. A. C. Dixon, said that Dr. Mansi needed little introduction. Those who did not know him personally knew that he had been working with viruses for a long time and had done a great deal of work in that respect.

Dr. Mansi had a number of slides and a film to show, and without further delay the Chairman invited him to present his paper.

Dr. W. Mansi introduced his paper by referring to 3 points: the first was the disease, the second the diagnosis of the disease involved, and the third the protection or immunisation against the disease.

He showed a number of slides illustrating a series of photographs taken of experimental inoculation of the visceral type of distemper, the strain being Glasgow S123. The slides were followed by a film showing variations of the substrain of the same virus.

Dr. Mansi concluded by explaining a slide illustrating the demonstration of antigen and antibody in infected animals during the course of the disease.

The Opener

Mr. R. Hanscomb, who opened the discussion, said that Mrs. Jones called upon him some time ago with an elderly male dog which, she complained, was drinking rather a lot of water and making puddles all over the place. She asked him whether he thought that it might be kidney trouble. After examining the dog, he informed her with due solemnity and an air of wisdom that her dog was suffering from chronic nephritis and polyurea. Mr. Hanscomb said he found that he stood in a somewhat similar relationship with the research worker or the specialist as that in which Mrs. Jones stood with him, in that the specialist had a habit of telling him much that he already knew in a language which he did not understand! It was for that reason that he was at first somewhat hesitant in accepting the invitation to open the discussion; but on reflection two points were brought home to him. He was invited not only on account of his undoubted and vast knowledge of the subject, but because he was a practitioner! Secondly, it was brought home to him that the confusion which existed in his mind on the subject—his remarks would be addressed mainly to the products for the vaccination of dogs against the two diseases rather than the clinical manifestations of the diseases—was not entirely the result of that which had been told him, but the result, very largely, of gaps in that information, and he hoped that he would promote, if not provoke, a discussion which would give the answers to some of the questions.

He was also kindly asked whether he would like to use a projector to demonstrate his remarks. Unfortunately, as a practitioner, he had too little time and had not the facilities to prepare that type of material. After all, he spent too much of his time discussing with his clients the advantages and disadvantages of the various vaccines which were now on the market. He spent too much of his time surveying the twitching remains of some wretched dog and trying very hard not to let the owner see that he had infinitely less faith in that piece of paper which stated that an unidentifiable puppy was vaccinated at the age of X with brand X than the owner had. He spent rather too much of his time trying to persuade the occasionally disillusioned client that it would in fact be worth vaccinating his next puppy, and trying to persuade him that the various vaccination policies were not simply a means whereby the veterinary profession took a penny out of the blind man's tin (although there were times where he felt that it was simply a case of the blind leading the blind!).

When it came initially to distemper, among the workers there was accord on one point at least, namely, that the egg-adapted living vaccine was the one of choice. From that point there was an immediate divergence of view. There were, on the one hand, those who would say that the vaccine, properly administered by a veterinary surgeon, would produce lasting immunity, and on the other hand—and Mr. Hanscomb subscribed to their view—there were those who said that vaccination did not produce a lasting immunity unless the animal so vaccinated was challenged by a field infection or by a subsequent dose of the vaccine. How one reconciled those two points of view, using an identical product, it was difficult to know, and how the practitioner was expected to guide his client with such conflicting evidence was difficult to understand. If by any chance one accepted that the immunity does wane, there was still conflicting evidence. There were those who said that it did wane to some extent and in some dogs, but that it was no use giving a booster dose because the dogs would not react until the immunity had diminished to such an extent that they had become susceptible again. His observations, for what they were worth, had convinced him that the vaccinated dog broke down less often in areas where the disease was enzootic, than in those areas where it was sporadic. He felt that many practitioners would support that view.

Practitioners were bedevilled at the moment by yet another issue of the allegedly "new" disease. In his view it was no more than distemper. He had no laboratory reports at his finger-tips and he spoke as a clinician, but should it prove to be no more than distemper, then heaven forbid that anybody should give it another name. There was already enough confusion in the minds of clients. In his opinion it was exactly what should have been expected. As a result of widespread vaccination, and the incidence of distemper being reduced over large areas, a sudden outbreak occurred, and a number of dogs having been vaccinated some time ago became susceptible. It was hoped that some of those working on the subject would endeavour to reconcile these two conflicting views.

On the subject of hepatitis he felt that he knew very much less. He had the feeling at the back of his mind, perhaps unfairly, that hepatitis vaccine was foisted on to the veterinary profession before sufficient was known about it. He wished to ask Dr. Mansi and any other of those

working on the subject a few questions before mentioning one or two of the products by type rather than by name.

Would any of those workers be prepared to give an estimation of the number of dogs that would in fact be immune or which had already been exposed to the disease by the time they were 8 or 10 weeks of age? It might well be said that one could vaccinate at a much earlier date. Suppose vaccination was done in kennels which were severely afflicted by hepatitis, and supposing the vaccination were carried out at 5 weeks of age, presumably under the guidance of the firms producing the vaccine, one would be vaccinating at 4 or 5 weeks because the puppies were susceptible, and there would be no maternal interference. Presumably then those puppies would be likely to become infected immediately the immunity from the mother had worn off, and prior to vaccination.

On the question of the vaccines themselves, he would reluctantly say to Dr. Mansi that the question of using a live unattenuated vaccine frightened him. Perhaps the author would be good enough to reply to two questions on the matter. It was not that Mr. Hanscomb queried the author's statement of facts. He did not want a statement of facts as an answer; but rather an explanation. Could the author state how it was that where the vaccine was installed in the conjunctival sac, he could state categorically that the dog could be confined with other susceptible dogs and that there would be no transmission of the virus from the vaccinated dog to the others? It would also be of interest if Dr. Mansi explained how the solid or, at least, very good immunity could be produced within 24 hours in an animal that was, prior to that, completely susceptible. It would seem that the animal which responded in that way was one which was already sensitised. Perhaps the author would also state whether the only means of determining the susceptibility of a particular individual was by determining the circulating antibodies, and was there not any other factor which might in fact be sensitising the dog yet not visible on normal test?

For protection against hepatitis there was the live attenuated vaccine and the dead vaccine, the latter being given in one or two doses. It was difficult to understand the dead vaccine which was given as a single dose. Assuming that one was vaccinating a completely susceptible animal, either that first dose was given on the assumption that the animal was in some way sensitised, or there was something magical about that one dose which others did not possess. The producers of the killed vaccine made that vaccine, he felt sure, not because it was cheaper or easier, but because they believed that it should be safer. Those who produced the living attenuated vaccine did so because they believed it to be more effective.

What was one striving for when vaccinating a dog against hepatitis? On the one hand, using live virus one could assume that better immunity would be produced, but how long did that immunity last, and in how many cases was a carrier state of the attenuated virus brought about? It was quite incomprehensible so far as he was concerned that any virus, be it unattenuated or an attenuated one, could stay in the kidneys for months or years without producing any kidney damage at all. On the other hand, there was the dead vaccine which would produce perhaps not such a good or lasting immunity as the live one. The supporters of that vaccine might say, "Well, our intention is to cover the danger period"; but what was the danger period, and what was the pattern of the danger period going to be as a result of widespread vaccination?

Mr. Hanscomb said he had a horrible feeling at the back of his mind that when Mrs. Jones came back to him —if she did—in 6 or 8 years' time with a middle-aged or elderly dog, and complained that he was drinking a lot of water and making puddles all over the place, she would say, "This is the second one I have lost in this way". Then when, perhaps inadvertently, he said that one of the causes could be hepatitis and Mrs. Jones replied "But you vaccinated my dog", was he to say, "I am sorry, I vaccinated your dog but the vaccine did not do its job"? Was he to say "I am sorry I vaccinated your dog and that is what eventually killed him"? The products which the drug firms were selling were not like washing powders or motorcars. If one bought a washing powder and it did not wash the whitest, it did not really matter; but if one chose the wrong vaccine of all those available, irreparable damage might be done. Frankly, he did not know of anything that should prevent one honest and sincere worker crabbing as hard as he liked the work of another. How was the veterinary surgeon to know which was the right one to choose unless all the workers in the field were completely and utterly frank with one another?

The General Discussion

Dr. S. E. Piercy (Beckenham) suggested that by far the most important problem from the point of view of the practitioner, and from the point of view of the laboratory worker who was asked from time to time to advise him, was the duration of immunity, and the need, if there be one, to revaccinate.

It was true to say that during the past 10 years or so views on the question of the duration of immunity had become modified, because various laboratory techniques had become available which enable a detailed study to be made of the antibody response of dogs to vaccination. Those techniques were not available 10 years ago. When vaccines containing attenuated virus were first introduced, various statements or claims were made by the producers about what their vaccines would do. There was now a great deal more information, and those concerned were in a better position to assess what happened in the vaccinated dog.

There was general acceptance among laboratory workers that if vaccinated dogs were exposed to the natural disease, and if the incidence of the disease were high enough to guarantee exposure from time to time, then for all practical purposes one vaccination would afford lifelong immunity. But the point was that in this country the incidence of distemper had declined so much, that many vaccinated dogs did not have renewed contact with the disease, and it might well be that a situation had arisen wherein a substantial proportion of dogs in this country were now losing their immunity and might be becoming susceptible.

It was known from work in this country and in the United States that many dogs given a single injection of vaccine could, if kept away from all possible contact, retain an adequate level of antibody and remain immune for many years; but it was also known that in a significant proportion of such dogs the antibodies would drop to a dangerously low level. If, therefore, there were a large number of dogs living in areas where distemper had not been known for many years and in which they were not getting the benefits of reinforcement by exposure, it could well be that a significant proportion were by now susceptible. That raised the point whether dogs at risk in that context should be revaccinated.

What were the criteria for revaccination? How could the practitioner know whether or not to advise revaccination? He desired in the first instance to ask Dr. Mansi what his views were on the duration of immunity, what was the need for revaccination, and what advice would he give to the practitioner.

There were two schools of thought on the question of revaccination and its effect. One school believed that there would be no beneficial effect from revaccination and no booster effect to antibodies unless at the time of revaccination antibodies had fallen to a certain minimum level. The feeling was that if a dog, when it was revaccinated, had a high level of antibody, then the vaccine virus would be neutralised by the circulating antibodies, and the dog would receive no beneficial effect. On the other hand, the second school claimed that there would be a beneficial effect from the revaccination of dogs still immune, and figures had been produced, particularly by a group of workers in the United States, claiming that if dogs with perfectly adequate levels of antibody were revaccinated, the antibodies would be boosted still further. Therefore, the second question was, what did the author think about the booster effect, and which school of thought did he favour?

Mr. S. A. Keeble (Greenford) referred to the question of duration of immunity and said they had been working with a group of dogs which had been in complete isolation for a period of 16 months. It was found that in 2 months the antibody reached a maximum antibody level "X" and it stayed level for 4 weeks and then started to fall off at a steady rate:

With the average sort of levels which one might expect of 1:300 or 1:600, the dog became susceptible between 2 and 2½ years. Dr. Piercy had mentioned that American workers had found that the immunity would last for 4 or 5 years in the absence of a natural boost, but to do that meant that the initial level would have to be 1:300,000, which was an extremely high level and could not be attained with the sort of vaccines on the market in this country at the present time.

As to the possibility of using a booster when the dog had a circulating antibody level against the virus, at Greenford some 300 dogs with different antibody levels had been selected, and the dogs were being revaccinated. The figures for 36 of those dogs were as follows: For dogs which had an initial antibody level between 0 and 1:100 the geometric mean of antibody titres after boosting was 1 in 1,067. In another group with antibody titres between 1:100 and 1:900 the geometric mean produced was 1 in 1,091. The figures were not significantly different and the antibody level produced in response to revaccination of dogs with a high antibody level was the same as that of the dogs with a low initial antibody level. There was obviously a difference in degree of response, because in one case a dog might not be able to get any higher because the antibody level was already maximal, and the dog which was almost negative would appear to go up to a relatively much higher degree.

With regard to the question of 24-hour immunity, he suggested that it could only be explained on the grounds of interference. It could not be due to antibody production because it did not occur so rapidly. It could be explained on the ground that the virus got round the body of the dog and prevented subsequent challenge. The release of the virus was slow, but it was sufficient to produce interference, and it was felt that it was the type of thing which occasionally occurred when using 2 living vaccines together. The author referred in his paper to a paper by Dr. Howell in 1961 in which it was pointed out that there was strong competition between the 2 viruses, and Dr. Mansi indicated he had found the opposite, which was confirmed by other workers. However, confirmation of a negative finding was no confirmation. Only a positive finding such as that the two viruses could interfere was valid. A negative finding was not really valid.

On the question of hepatitis, at present it seemed that it was the dog under 12 months of age which particularly needed protection. The older dog seemed to be much more immune. What the position would be when the vaccination reduced the amount of street virus and produced a much more susceptible unvaccinated adult population was not known.

In a fairly extensive survey of field material, it had been found that 12 per cent. of the dogs were immune between 6 weeks and 3 months, and that rose rapidly until 75 per cent. were immune by 8 to 9 months of age. Obviously, therefore, the earlier that dogs could be vaccinated the better.

Dr. R. F. Sellers (Beckenham) said that in his view neither Dr. Mansi nor Mr. Hanscomb had paid sufficient attention to the dog itself. One should consider the environment in which the dog was living. This could roughly be divided into 3, *viz.*, the puppies which belonged to breeders, which were usually very healthy and well looked after. The breeders vaccinated at 9 weeks and would, for economic reasons, revaccinate as often as they could in order to protect their livelihood. Then there was the dog which was kept in the country or in some areas of the town away from distemper or hepatitis infection. They were, in general, in no danger from the disease once they were vaccinated. However, they were the problem dogs from the point of view of whether one should consider revaccination. The third category was what one might call the town dog, living in certain areas of towns such as London, Glasgow, Southampton, and so on, where distemper was endemic. That presented a great problem at the time of vaccination, because if they had been in contact with other puppies or sources of infection as was most likely, then at the time of vaccination they would probably be incubating the disease. Hence the advice to give clients was that they should keep their puppies away from contact with disease and from other dogs until they had been vaccinated.

With regard to the maternal antibody which had been passed on to the puppy, undoubtedly once this maternal immunity had disappeared with the vaccines at present available, there would be great success. Dr. Piercy and himself had found at least 97 to 98 per cent. success in puppies where there was no maternal immunity. Some, however, still had maternal immunity and they might or might not respond. As far as hepatitis was concerned, it had been found that even those which had a certain amount of maternal immunity in many cases still responded to the vaccines, and were immune when tested a month or 2 months later. But there was always a chance that those which had maternal immunity might not respond, and it was probably wise in a certain number of cases to revaccinate them.

Dr. Mansi referred to the adaptation of hepatitis virus to the chick embryo, and it would be of interest if he would elaborate on this and also explain why he recommended vaccinating with it at the same time as the installation in the eye of the virulent hepatitis virus.

Mr. H. A. Crawshaw (Newbury) asked whether the author could give the latest information about the so-called new disease about which there had been considerable publicity. Was it in fact an outbreak of distemper in dogs which had lost their immunity, or was there some truth in the fact that it might be a slight variation of the distemper virus?

Mr. G. W. Meadows (Evesham) referred to the case of the so-called new disease, which was probably a variation of distemper, and said he would like to know to what extent present vaccines were effective against it. Secondly, he gathered that the symptoms seemed to vary greatly.

With reference to antibody levels, it would be of interest to know whether there is any significant difference in the antibody levels given by various vaccines, or whether they gave identical levels. Some people held that there was interference between one vaccine and another. Others held that there was not; but if the former were correct, how long after one vaccine had been given should the other be given and, if necessary, in what order?

Dr. S. E. Piercy (Beckenham) said that Dr. Keeble had referred to results obtained by his colleagues and himself when revaccinating dogs with various levels of immunity. Dr. Keeble was only able to quote the results in the case of 36 dogs at the moment, and Dr. Piercy said he could only quote results in the case of 28 dogs; but since his results were so different, he felt it necessary to refer to them!

The 28 dogs had all been immunised at various periods of time beforehand, and they had various levels of antibody. One dog had an antibody titre of 2.4, which was near the borderline between susceptibility and resistance. Revaccination resulted in a rise to 3.3. In another dog, which had an antibody titre of 2.8, the figure rose to 3.5. In the remaining 26 dogs, having antibody titres between 2.6 and 4.5, however, there was no increase following revaccination.

Further, Dr. Sellers and himself had immunised 225 puppies with combined vaccine containing living distemper and hepatitis viruses. They were under trial conditions and were in kennels. Of those 225 puppies it was found that 172, when tested at 9 weeks, which was the normal age advised for vaccination in this country, either had no antibody, or their antibody titres were below the level regarded as borderline between susceptibility and resistance. Of those 172, when examined a month after vaccination, 97 per cent. had responded with the development of high levels of antibody. What about the 3 per

cent.? The 3 per cent. was represented by 5 dogs, and of those 5 dogs 2 responded rather poorly but would probably have resisted natural infection. Of the 3 remaining dogs which did not respond, one remained available for a second dose of vaccine some time later, and again its antibody level did not change. It was possible to retain this animal and give it a third shot of vaccine, and again its antibody level did not shift. Some time later it was challenged but did not contract distemper. In other words, in any population of dogs there would be one or two which seemed quite refractory to immunisation in the sense of responding by the development of antibody, but it did not mean to say such dogs were necessarily at risk.

Another interesting point was that in the group of 225 dogs, a considerable proportion still had maternal antibodies, and the overall immunisation figure of the group, including those which had some maternal antibodies, was only 85 per cent. That raised the interesting question whether 15 per cent. of the dogs in this country were not being adequately immunised. It must be that the great majority of the 15 per cent. survived. They either came into contact with distemper early in life and had their maternal immunity converted to the active state, or they did not come into contact with the disease at all, or they went through a mild infection of distemper at some time when the owner noticed nothing. Obviously if 15 per cent. of dogs were not being adequately protected by vaccination, we would all be out of business! If a dog at 9 weeks was truly susceptible in the sense of its antibody being at a very low level, one could expect 97 to 98 per cent. response with a combined living vaccine. He would challenge anyone to produce figures better than 97 to 98 per cent. with any kind of vaccine.

Mr. T. C. Denholm (Carlton, Notts) pleaded with firms producing vaccines to hesitate a little when they brought out a new vaccine before they rushed into print claiming all sorts of things for the product. He knew something of the large amount of work which was put into the production of the vaccines as well as the research that was entailed, but he could not help thinking that nothing could compare with the experience which the practising veterinary surgeon gained in the use of the vaccines in his practice.

In the last 12 to 15 months there had been a number of breakdowns to his knowledge. In the vast majority of cases those breakdowns occurred in young animals of 18 months to 2 years of age, and in his view one of the reasons why those breakdowns occurred was because the incidence of distemper was declining. All the dogs in years gone by had been in contact with heavy infection and had built up a fairly high level of immunity. As a result they were standing up to what infection was left. The younger dogs vaccinated in the last 18 months were not coming into contact with natural infection. They were not having their immunity boosted. Nevertheless, it was very difficult to explain to Mrs. Jones why her dog which was immunised 12 months earlier had broken down. It had been said that possibly the dog had been in contact with infection just before being inoculated or immediately afterwards. Mr. Denholm was prepared to accept that that was a risk which must be taken. It was also stated that if the vaccine were not kept properly there would not be a response. He was not prepared to accept that, because he kept his vaccines according to the manufacturers' instructions. It was further said that if a proper syringe were not used there would be breakdown; but he was not prepared to accept that in his particular practice. He could not explain some of the breakdowns. The situation culminated last January when a puppy which he had had in his surgery developed distemper and he had vaccinated the puppy some 6 months previously. He knew that it had been vaccinated with a vaccine which had been kept under proper conditions. He knew it had been vaccinated with a vaccine from a syringe which was sterile, and he knew that the puppy had not been in contact with infection before vaccination or immediately after the injection. The worrying factor was that the puppy happened to belong to him! When he approached the firm concerned he was told, "You must appreciate that with certain individuals you do not get any response to vaccination." That was fair enough. He might be prepared to accept that, but Mrs. Jones was not prepared to accept it. Therefore, he repeated his plea to firms to be careful to remember that although they were manufacturing and marketing the vaccines, it was the poor practitioner who had to carry the can back when the dog broke down.

Miss J. O. Joshua (Finchley) said she desired to mention 2 points in the paper, the first of which Dr. Mansi skipped over somewhat lightly, and one wondered whether he felt that he was treading on thin ice; and that was the question of the age for immunisation. She stated quite categorically that in her view the recommendation to immunise puppies at 9 weeks of age was *wrong*. She would not immunise them before 11 weeks of age other than in exceptional circumstances. She had followed with very great interest the American work, which had shown clearly that a proportion—small but none the less significant—retained a level of maternal antibodies until beyond the ninth week of life—some of them indeed until the twelfth week, but by then the number was so small that one could not be unreasonable and insist upon delaying immunisation until then.

Dr. Piercy's figures were very interesting. It would be noted that over 50 of his 225 dogs at 9 weeks of age retained maternal antibodies and so were possibly not susceptible to immunisation. That seemed to be much too high a proportion to ignore. She found that one could get one's clients to continue to isolate their dogs until 11 weeks of age and, if one talked to them reasonably and explained that the infant did not "take" to vaccination at that age—she used that simple word advisedly—most of them understood it and were quite prepared to abide by one's advice.

She had seen breakdowns in puppies immunised at 9 weeks of age, and she supported Dr. Mansi in his classification in saying that those puppies which showed signs of virus infection within 3 months of immunisation were in fact incubating the disease at the time, and that those which developed the disease subsequently were in fact breakdowns. She had seen genuine breakdowns in puppies immunised at 9 weeks of age—not in her practice—and had seen 1, and only 1, in her own practice where the puppy was immunised at well over 3 months of age under the conditions which she specified. In that case one must conclude that it was amongst the very small percentage which Dr. Piercy had mentioned which seemed never to respond to immunisation at all.

The other point concerned the question of hepatitis vaccination. Most speakers had emphasised that that was only important in young dogs. With that she could not agree. Cases had been seen in older dogs. In fact, she had one fatal case in a 12-year-old, and the diagnosis was confirmed in the laboratory. It was not based only on her own clinical diagnosis, and she very strongly urged all dog owners to have their dogs immunised against hepatitis with a *living* vaccine, if she had no knowledge that they had had hepatitis and if they had not been immunised. She felt strongly that it was very well worth while doing even though the number of fatal cases might be comparatively small.

Mr. D. G. Earnshaw (Dublin) said there was one point the explanation of which eluded him at the present moment. It was generally agreed that vaccination against distemper was undesirable before a puppy was 9 weeks old, because maternal antibodies might interfere. Yet one could revaccinate a dog later which still had a level of antibody titre and that titre would be boosted. Perhaps Dr. Mansi had some explanation of that phenomenon. Were the antibodies of different nature?

Mr. Keeble (Greenford) said that without wishing to enter into a public debate with other workers, he desired to point out that he did not base his facts regarding interference on the small proportion of dogs which failed to develop any type of antibody, as reported by Dr. Piercy, but on the dogs which developed excessive amounts of hepatitis antibody to the detriment of the distemper virus.

As to Dr. Piercy's failure to boost distemper antibody titres, one could only suggest that a possible explanation was that Mr. Keeble and his colleagues worked with slightly different vaccines which might have some different properties in those circumstances.

It was stated earlier that under natural conditions contact with field virus could give a boost. In fact, for lasting immunity that was essential. One would expect that contact with live attenuated vaccine would do the same, as in fact was found.

It would seem that the combination of live vaccine and antiserum acted as an inactivated vaccine. If initial sensitisation had taken place by primary vaccination, a booster response would occur, raising the titre to a high level. If there had been no primary antigenic stimulus as was the case in a young puppy where the circulating antibody was of maternal origin, live vaccine neutralised by antiserum produced no antibody rise, this was consistent with the hypothesis, since an inactivated antigen requires 2 administrations in order to produce an adequate response.

The Reply

Dr. W. Mansi, in reply, said that in his view one could not immunise puppies as young as 2 or 3 weeks. It would be a waste of time because it was not possible to infect puppies of that age. As to the question of the puppy brought to the surgery at the age of 7 weeks for vaccination, clinically healthy and possibly having been in isolation at home, through being admitted to the surgery the chance of exposure to infection was considerable. Therefore, in his opinion, it was more advisable to protect the puppy by administration of a potent anti-viral serum than either to vaccinate it or to leave it alone. Puppies treated with immune serum at that particular period would be protected for 2 to 3 weeks. At the end of 3 weeks they would be vaccinated, and this procedure had proved very successful.

The important point about the response of the young puppy and dog which had lost its immunity was as follows. It is possible to stimulate, by inoculating a live virus, the antibody response within a week in an adult immune animal in which demonstrable antibodies have waned, as indicated by complement fixation and gel diffusion precipitin tests. This is not the case with a puppy born to an immune bitch. On inoculation of the live virus no significant response is produced. Therefore it would be difficult to attribute the resistance of the very young puppy to antibodies of a similar nature to those of the adult immune animal.

Dr. Mansi understood from a previous speaker that revaccination of an immune animal did not increase its antibody-titre. He found this difficult to understand as it is the usual procedure in preparing immune serum in animals to inoculate multiple doses of the agent.

There was no harm in revaccinating an animal if it could be done every month; but there was no particular point in doing it. Fairly good immunity should last from 2 to 2½ years if the dog were kept in complete isolation. If a previously immunised animal was inoculated with virulent distemper and a sample of its blood were taken within 24 to 48 hours, it was possible to recover the virus, but not after or before that time.

The question was raised why the hepatitis virus produced resistance within 24 hours. The idea was that the virus was put in the eyelid adjacent to the lymphatic system, and it was found that antibody formation/resistance was much quicker.

As to circulating antibodies, in the early days antibodies were recognised as such, but nowadays there are neutralising, complement-fixing, precipitating, haemagglutinating antibodies. Obviously there must be other types of antibodies which at the present time we are unable to demonstate with the means at our disposal.

If a client brought a dog to the surgery and asked whether it should be revaccinated, the first vaccination having taken place some 4 or 5 years earlier, the practitioner was faced with an awkward problem. If the people who prepared the vaccine had stated that the vaccination gave lasting immunity, then the practitioner was justified in not revaccinating the animal. But then supposing by mischance the dog contracted the disease within a few days, or weeks later, and died? There was still that difficulty, because revaccination would boost immunity. It was difficult to see any harm in revaccinating if the owner was quite willing and the dog was in a condition to receive it.

As to the suspected new disease, he had examined a number of dogs and had found that the majority of them were in fact suffering from the distemper complex. There were cases where something else would be found, possibly a bacterial infection. He drew attention to a recent publication by workers in France concerning the so-called contagious tonsilitis which, according to them, produced a condition similar to that produced by the distemper complex.

Mr. H. A. Crawshaw (Newbury) moved a vote of thanks to Dr. Mansi for his valuable contribution to present knowledge of canine virus immunology. It was a most important and controversial subject and one shrouded in mystery for many practitioners. Dr. Mansi had carried out a great deal of original work in connexion with virus diseases of dogs and the meeting had been very interested in his paper that day. He also thanked Mr. Hanscomb for raising so many interesting points in opening the discussion.

The vote of thanks was carried by acclamation.

General Articles

A Possible Dwarf Form of *Dictyocaulus filaria* from a Waterbuck, *Kobus leche*, in Northern Rhodesia

BY

W. M. FITZSIMMONS

Commonwealth Bureau of Helminthology, St. Albans, Herts.

SUMMARY.—The lechwe waterbuck (Kobus leche, *Gray*, 1850) *is recorded as a new host for* Dictyocaulus filaria (*Rudolphi*, 1809; *Railliet & Henry*, 1907) *in Northern Rhodesia. A brief description of the specimens available is followed by a discussion on the taxonomy of* D. filaria *and a summary of the present status of this species.*

Description

THE following description, in tabular form below (Table I), is made from 4 complete males and 4 complete females, all adult, recovered from the lungs of a lechwe in Lochenvar, N. Rhodesia, and sent to the Bureau of Helminthology by Mr. D. A. Hutchings. It is to be noted that in one of the 4 males the dorsal ray of the bursa has a common trunk at its base (see Fig. 2).) The cleft between the partially fused medio- and postero-lateral rays of the bursa is about 16 to 20 μ deep and the free

TABLE I.

SUMMARY OF THE CHIEF MORPHOLOGICAL FEATURES OF *Dictyocaulus filaria* FROM *Kobus leche* (ALL FIGURES IN MILLIMETRES).

Males:	
Total body length	29.0 to 34.0 (average 31.8)
Maximum body width	0.23 to 0.30 (average 0.25)
Length of oesophagus	0.70 to 0.85 (average 0.74)
Length of spicules	0.200 to 0.240 (average 0.212)
Females:	
Total body length	30 to 42 (average 37)
Maximum body width	0.25 to 0.26
Length of oesophagus	0.72 to 0.80 (average 0.77)
Tail length	0.24 to 0.38 (average 0.31)
Dimensions of egg	0.080 to 0.088 × 0.040 to 0.048

Protection Against Canine Virus Diseases in Great Britain.—*Concluded.*

extremities are well separated. The vulva is slightly behind the middle of the long axis of the body, *i.e.* in the posterior half of the body. The spicules do not show the acute angle and swelling at the junctions of their distal and middle thirds that is usually figured in lateral views but tend to be more gently curved and regularly tapered.

Discussion

The recorded species of *Dictyocaulus* which have the medio- and postero-lateral rays of the bursa only partly fused are:—

1. *Dictyocaulus arnfieldi* (Cobbold, 1884) from the horse, ass, zebra and Indian tapir.
2. *Dictyocaulus magna* (Mönnig, 1932) from the blesbok (*Damaliscus albifrons*) and the springbok (*Antidorcas marsupialis*).

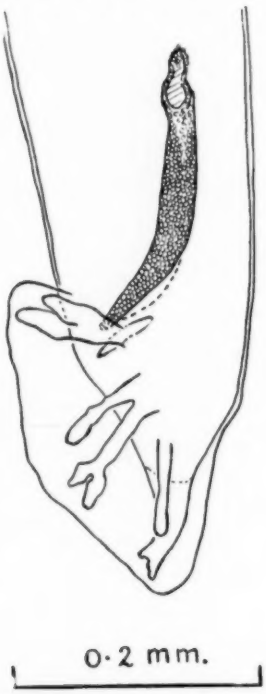


FIG. 1.—*Dictyocaulus filaria* from *Kobus leche*. Posterior extremity of male, lateral view.

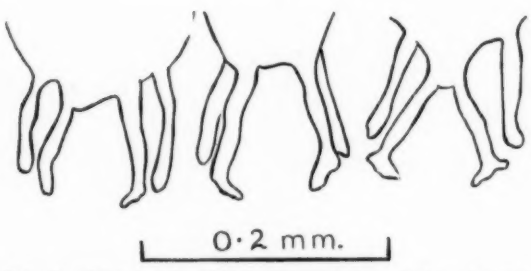


FIG. 2.—*Dictyocaulus filaria* from *Kobus leche*. Dorsal and externo-dorsal rays of bursa showing variations in mode of origin of dorsal ray.

3. *Dictyocaulus filaria* (Rudolphi, 1809) from domestic and wild sheep and goats (*Ovis* and *Capra* spp.), the saiga (*Saiga tartarica*—a sheep-like antelope), deer (*Cervus* and *Odocoileus* spp.) and the camel (species of camel unknown). There are also records from cattle.
4. *Dictyocaulus unequalis* (Bhalerao, 1932) from the Hodgson argali (*Ovis ammon hodgsoni*).
5. *Dictyocaulus sibiricus* (Orlow, 1934) from the domestic sheep.

The last 2 species have been made synonyms of *Dictyocaulus filaria, i.e. D. unequalis* by Dikmans (1936) and *D. sibiricus* by Dougherty (1946).

Descriptions of *D. filaria* by Baylis (1936), Dikmans (1936), Mönnig (1956), Neveu-Lemaire (1936) and Skrjabin, Shikhobalova and Schulz (1954) include the following range of dimensions: length of males, 30 to 80 mm.; length of females, 50 to 120 mm.; length of spicules, 0.320 to 0.640 mm.; dimensions of egg 0.112 to 0.138 mm. × 0.052 to 0.091 mm.

The morphological features most subject to variation within the species *D. filaria* have been the general size of the males (total length) and the length of the spicules.

The information in the present paper indicates a greater variation in the size of mature males and females, in the length of the spicules and in the dimensions of the eggs. In the examples from the lechwe the spicules are not so acutely bent and swollen and the split extremities of the partially fused medio- and postero-lateral bursal rays are constantly widely separated whereas in all other figures of this species they are shown to be closely applied to each other. The bursa in the four male specimens from the lechwe is less than half the size of that figured for the species by Skryabin, Shikhobalova and Schulz (1954). In many ways the examples from this new host could be described as a dwarf variety. More material needs to be collected before it can be decided whether the lechwe is an accidental host or whether it is the host of a distinct species morphologically very similar to *D. filaria*.

Acknowledgments.—The writer is very thankful to Mr. D. A. Hutchings, M.R.C.V.S., D.T.V.M., for sending him the material described and to Dr. S. M. Willmott, the Director, Commonwealth Bureau of Helminthology, for permission to publish this paper.

References

BAYLIS, H. A. (1936). "The Fauna of British India, including Ceylon and Burma. Nematoda Vol. I (Ascaroidea and Strongyloidea." P. 389.
BHALERAO, G. D. (1932). *Ind. J. vet. Sci.* **2.** 242.
DIKMANS, D. (1936). *J. Wash. Acad. Sci.* **26.** 298.
DOUGHERTY, E. C. (1946). *Proc. helm. Soc. Wash.* **13.** 49.
MONNIG, H. O. (1932). *Rep. vet. Res. S. Afr.* **18.** 153.
———. (1956). "Veterinary Helminthology and Entomology." London.
NEVEU-LEMAIRE, M. (1936). "Traité d'Helminthologie Médicale et Vétérinaire." Paris.
ORLOV, N. P. (1934). In Skrjabin, K. I., and Shul'ts, R. S. "Diktiokaulezy domashnikh zhivotnykh i meri bor'bi S nimi (Monograficheski etiud)." 56 pp. Moscow.
SKRYABIN, K. I., SHIKHOBALOVA, N. P., & SCHULZ, R. S. (1954). "Principles of Nematodology." Vol. IV. Dictyocaulidae, Heligmosomatidae and Ollulanidae of animals." (In Russian.) 323 pp. Moscow.

A Survey and Appraisal of the Methods Used by Farmers to Control Fascioliasis

BY

C. B. OLLERENSHAW and S. A. ROWCLIFFE

Ministry of Agriculture, Fisheries and Food,
Central Veterinary Laboratory, New Haw,
Weybridge, Surrey

SUMMARY.—The results of a survey in parts of Cornwall and Anglesey of the methods used by farmers to control fascioliasis show that apart from dosing sheep little attempt is made to control the disease. Even in the dosing of sheep there is a wide range of practice with the majority of farmers not dosing as frequently as is usually recommended. An appraisal of the value of this dosing is presented together with some suggestions for improving control.

Introduction

WIDESPREAD interest in fascioliasis followed the severe outbreaks of the disease which occurred in Britain in 1958–59. As was to be expected, much of this interest centred on the methods used to control the disease. Recently a survey of some hundred farms, half in a "flukey" district in Cornwall, and half in a similar area in Anglesey, was undertaken in order to determine the methods of control used in 1958–59, and how these compared with methods used in the normal year.* Other aims of the survey were to assess the extent of the division between the recommendations for controlling the disease and those put into practice, together with an evaluation of these methods. Such considerations are of great importance to all concerned in improving control.

Methods Used in the Survey

Farmers were asked first whether they had any trouble with the disease in their sheep and cattle, and if so, what their losses were in a normal year and in 1958–59. Questions on methods of control centred on dosing, the type of anthelmintic used, whether it was ever toxic to stock, and the months when treatment was undertaken. Similar enquiries about the occurrence of black disease and the use of a vaccine also were made.

No direct questions were asked regarding the use of molluscicides, drainage, or the grazing of dry and avoidance of wet fields in the control of the disease; instead these questions were put indirectly by asking "What other methods of control are used?" In this way the requisite information was obtained only where these measures had been applied in a deliberate attempt to control the disease.

Results

Fifty-four farmers in the Whitstone district of Cornwall, and 51 farmers in the Llanerchymedd district of Anglesey were questioned. All except 5 (1 in Cornwall and 4 in Anglesey) kept sheep, but flocks in Cornwall rarely numbered more than 100 breeding ewes, consisting chiefly of Devon Long or Close-wools, whilst those in Anglesey rarely numbered less, Welsh Mountain being the dominant breed. Only 1 farmer (in Anglesey) did not keep cattle.

In order to determine whether control measures varied according to the incidence of disease, all farms were classified into groups based on the severity of losses in sheep in 1958–59, and whether or not dosing was carried out. The precise classification showing the percentage of farms in each group is shown in Table I. Included in this table are figures showing the percentage of farms where the same dosing programme was employed each year irrespective of losses, as well as the percentage where dosing was increased.

These figures confirm that fascioliasis in both areas, but particularly in Anglesey, constituted a very serious problem to the farmer in 1958–59. Even so, 25 per cent. of the farmers interviewed employed the same dosing programme in 1958–59 as in the normal year, a substantial proportion of those losing 50 per cent. or more of their flocks being included in this 25 per cent. It is interesting to note, however, that only 9 farmers, 7 in Anglesey and 2 in Cornwall, admitted to having losses from fascioliasis in years other than "bad fluke years."

On farms where precautions were never taken and where losses were not experienced in 1958–59 it was concluded that there was no fluke problem and these farms were excluded from further analysis.

Dosing Practices

The average number of doses given in the normal year compared with 1958–59 is shown in Table II. Included in this table are figures showing the maximum and minimum number of doses given by farmers in each group, in the normal year and in 1958–59, as well as the range of dosing practices as between farms with the same practice each year and those with a varying practice. Although in terms of averages twice as much dosing was carried out in 1958–59 as in the normal year when each ewe was treated 1·5 times, the importance of these data lies in the wide range of varying practices. Although more dosing was undertaken in Anglesey than in Cornwall in the normal year, the reverse was true in 1958–59. This greater flexibility in the dosing programme in Cornwall was reflected in the

* The term "normal year" is used to denote all years other than those in which severe epidemics occurred.

TABLE I
CLASSIFICATION OF FARMS ON THE BASIS OF DOSING AND SEVERITY OF LOSSES IN SHEEP IN 1958–9
SHOWING THE PERCENTAGE OF FARMS EMPLOYING THE SAME PRACTICE EACH YEAR, AND THE PERCENTAGE WHERE DOSING WAS INCREASED IN 1958–9

Class	Cornwall			Anglesey			Combined		
	Total per cent.	Per cent. with same practice each year	Per cent. with increased dosing in 1958–9	Total per cent.	Per cent. with same practice each year	Per cent. with increased dosing in 1958–9	Total per cent.	Per cent. with same practice each year	Per cent. with increased dosing in 1958–9
No dosing, no losses ...	11			6			9		
No dosing, but losses ...	0			4			2		
No losses, but dosing ...	32	11	21	6	2	4	20	7	13
1—14 per cent. mortality ...	15	2	13	24	7	17	19	4	15
15—49 per cent. mortality	29	1	28	32	15	17	30	8	22
> 50 per cent. mortality ...	13	6	7	32	6	26	22	6	16

TABLE II
SHOWING THE AVERAGE NUMBER OF DOSES GIVEN TO SHEEP WITH DETAILS OF THE VARIATIONS IN DOSING PRACTICES

	Normal year			1958–9			Farms with the same practice each year		Farms with increased dosing in 1958–9	
	Ave. No. of doses	Min. No. of doses	Max. No. of doses	Ave. No. of doses	Min. No. of doses	Max. No. of doses	Min. No. of doses	Max. No. of doses	Min. variation	Max. variation
Cornwall										
No losses	1·3	0	5	2·2	1	5	1	5	0—1	52—5
1—14 per cent. mortality	1·0	0	2	3·1	2	6	2	2	2—3	2—6
15—49 per cent. mortality	1·1	0	4	3·7	1	8	—	—	0—1	2—8
> 50 per cent. mortality	1·4	0	3	3·8	1	8	1	3	0—2	0—6
Anglesey										
No losses	1·3	0	4	2·3	1	4	4	4	0—1	0—2
1—14 per cent. mortality	1·6	0	3	2·0	0	4	1	3	0—1	2—4
15—49 per cent. mortality	2·0	0	6	2·9	0	6	1	6	1—2	2—5
> 50 per cent. mortality	1·5	0	4	2·9	2	6	2	3	1—2	2—6
Cornwall (all groups)	1·3			3·1						
Anglesey (all groups)	1·7			2·7						
Combined (all groups)	1·5			2·9						

increase in the average number of doses which paralleled increasing mortality in 1958–59.

Further analysis of these data showing the percentage of flocks which received identical treatment as regards frequency of dosing is given in Fig. 1. In addition to individual columns of the histogram representing the percentage of flocks which received 0, 1, 2, 3, and more doses, each column itself is subdivided so as to show the severity of losses experienced by flocks receiving identical treatment. For instance in Cornwall in 1958–59 of the 6 per cent. of flocks given eight doses, 4 per cent. experienced 15 to 49 per cent. mortality and 2 per cent. more than 50 per cent. mortality. It is clear that about 80 per cent. of flocks in both Cornwall and Anglesey received no more than 2 treatments in the normal year, the majority either not being treated or receiving a single dose. Although there was an increase in dosing in 1958–59 the majority of flocks still received no more than 3 treatments.

No uniform relationship existed between the severity of losses and number of doses given to flocks. In Anglesey in 1958–59, for instance, one flock in the 15 to 49 per cent. mortality group received no treatment at all, whilst another in the same group was given 6 doses. Each mortality group was equally represented among flocks dosed 4 times, whilst exactly half of all the flocks experiencing a 50 per cent. or more mortality were dosed twice only, this group accounting for more than half of all the flocks given this treatment.

Although in general an increase in the number of doses given to flocks in Cornwall in 1958–59 occurred with increasing mortality, there were exceptions, flocks in the 50 per cent. or more mortality group being given one or two doses, whilst others dosed 5 times experienced no losses.

Analysis of these data showing the percentage

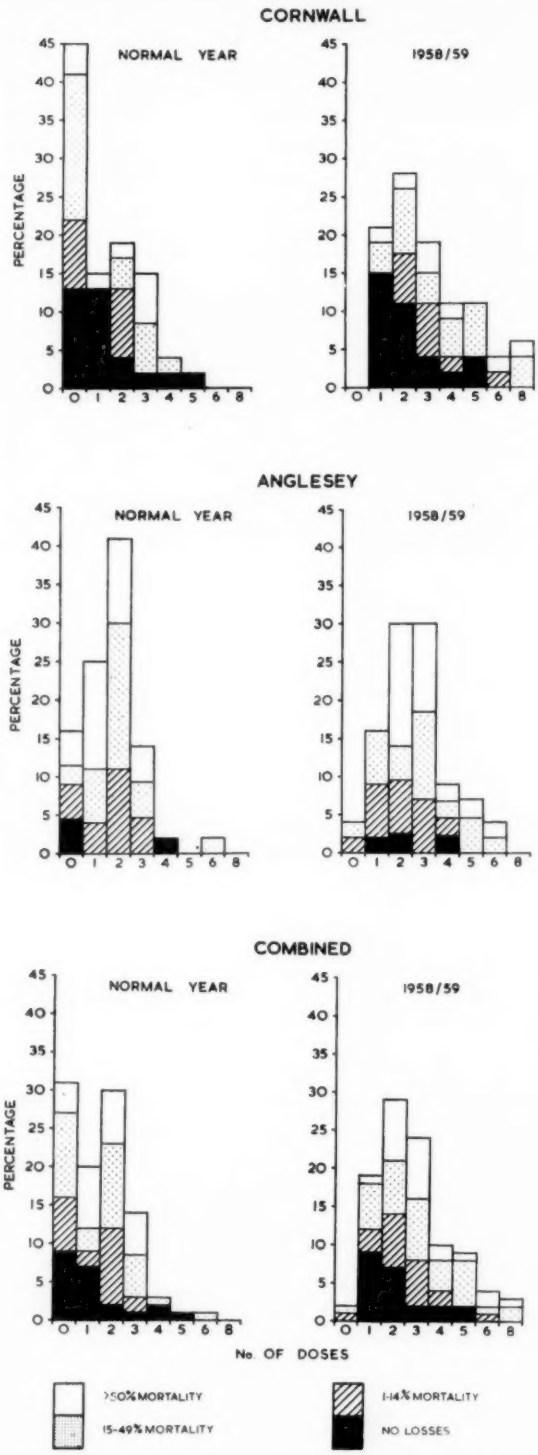


FIG. 1.—Histogram showing the frequency of dosing.

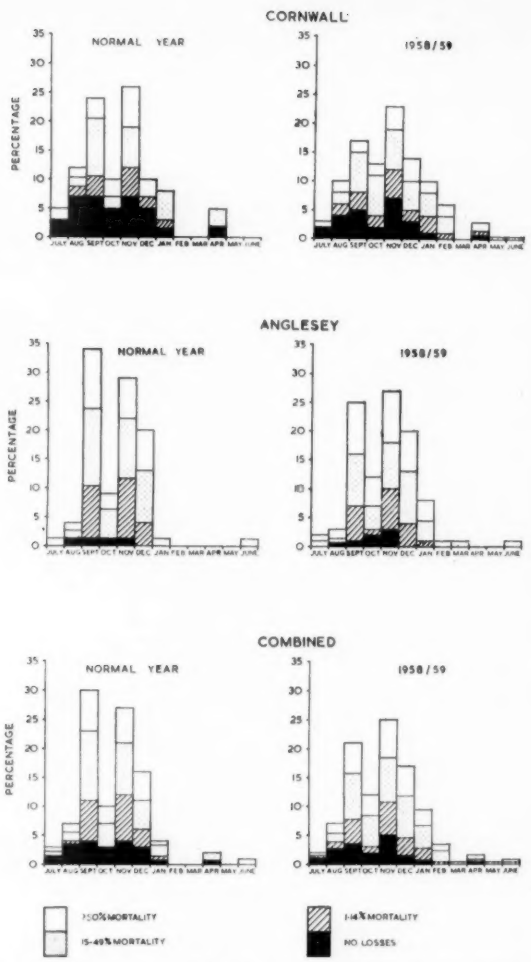


FIG. 2.—Histogram showing the percentage of the year's dosing undertaken in each month.

of the year's dosing undertaken in each month is shown in Fig. 2. The monthly pattern of dosing in Anglesey was similar in both the normal year and in 1958–59, over 80 per cent. of the dosing in the normal year and 70 per cent. in 1958–59 being undertaken in September, November and December. In Cornwall dosing in September and November still dominated the pattern, but there was less rigidity in the timing particularly in 1958–59.

It is of interest to record that less than 15 per cent. of the year's dosing (assuming the dosing year commenced in July) was undertaken after December in Cornwall in the normal year compared with about 20 per cent. in 1958–59. The corresponding figures for Anglesey were much lower, being 3 per cent. and 11 per cent.

In both areas in all years there was a sharp fall in dosing in October, the month when most ewes were with the ram, and a general avoidance of dosing

in the lambing months of February and March. A few farmers in Cornwall, however, have made it a practice to dose their ewes in April after lambing.

In spite of the great concentration of dosing into a few months, and the avoidance of dosing in others, it is rather surprising to find that in the combined data for 1958–59 some dosing was undertaken in every month of that year.

The results of an attempt to clarify the differences in dosing practice between the normal year and 1958–59 are shown in Figs. 3 and 4. The first of these figures shows the months when farmers started dosing their ewes, the second when they finished. The number of farmers shown in each month either to commence or terminate their dosing, is expressed as a percentage of the total number of farmers undertaking dosing. It must be remembered, however, that in the normal year in Cornwall 45 per cent. of the farmers did not dose their ewes at all (see Fig. 1).

In the normal year in Anglesey, the period over which farmers started dosing their ewes extended over 5 months from July to November, although 68 per cent. of the total commenced in September.

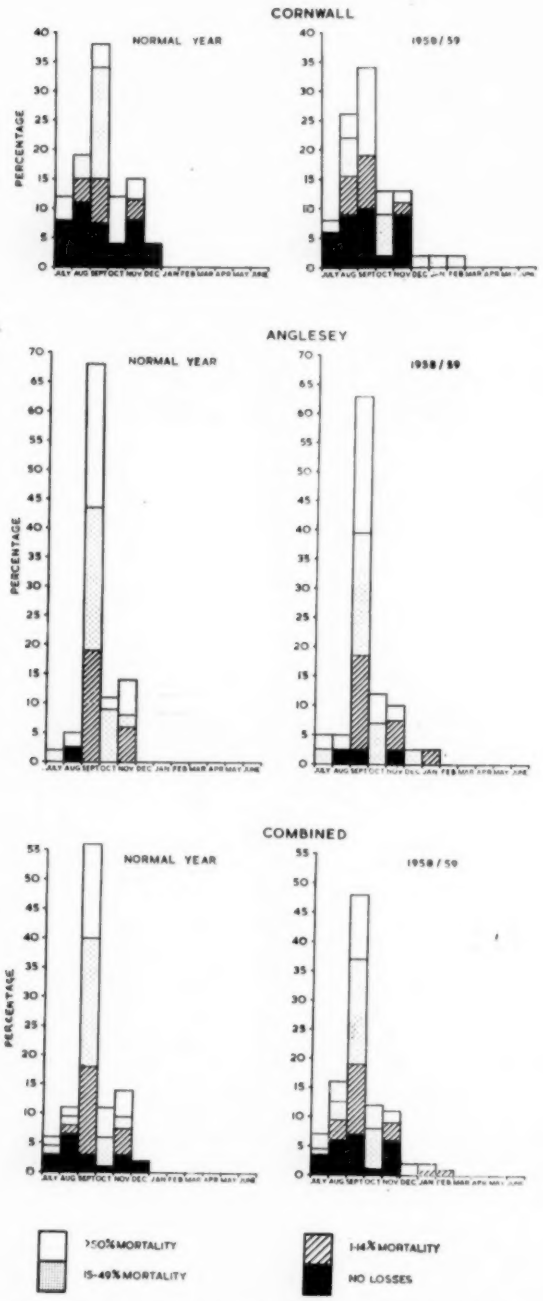


FIG. 3.—Histogram showing the months when farmers commenced dosing their ewes.

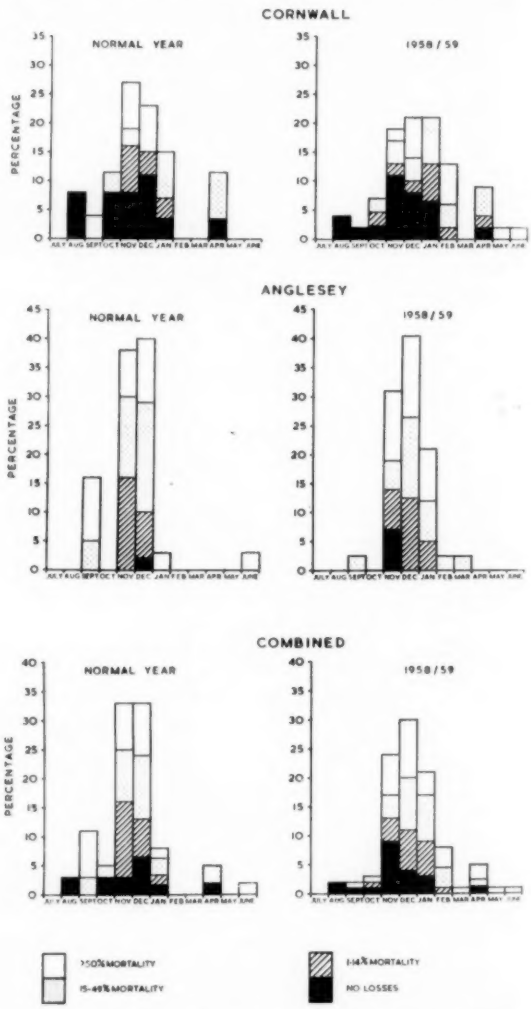


FIG. 4.—Histogram showing the months when farmers finished dosing their ewes.

In Cornwall, this period extended from July to December with under 40 per cent. commencing in September.

The corresponding sets of figures for 1958–59 are remarkably similar to those in the normal year. In both areas there was an extension of the season for a further 2 months—to February in Cornwall and January in Anglesey. This extension was the result of a few flocks not normally dosed receiving treatment after experiencing losses.

In Anglesey in both the normal year and in 1958–59, 70 per cent. of the farmers finished their dosing in either November or December. In 1958–59, however, fewer farmers finished their dosing in September, and several prolonged their dosing season to January, a few to February and March. Termination of the dosing season in Cornwall was not confined to November and December to the same extent that it was in Anglesey; in the normal year it extended over seven months and in 1958–59 over 10 months. About 75 per cent. of the farmers in Cornwall had finished their dosing by the end of December in the normal year compared with 50 per cent. in 1958–59. The corresponding figures for Anglesey were 97 per cent. and 73 per cent. Again no precise relationship is apparent between either the commencement or termination of dosing and the severity of losses. For instance, in both Anglesey and Cornwall in 1958–59 some farmers who experienced 50 per cent. or more losses in their flocks terminated their dosing in November, whilst others with no losses, or less than 14 per cent. mortality, continued dosing until January or February.

Drugs Used

Dosing sheep with hexachloroethane predominated in Cornwall in marked contrast to Anglesey where carbon tetrachloride was the drug of choice. The precise figures are shown in Table III. Most farmers in Cornwall had little idea of the size of the dose of hexachloroethane that was given to their ewes, simply making up individual doses supplied by their veterinary surgeon. A few bulked the doses together, although they realised that some sheep would receive more and some less than the allotted dose. Nearly all found dosing with hexachloroethane messy, and a few who were single-handed considered its use difficult. There were no reports of hexachloroethane being toxic to stock.

The amount of carbon tetrachloride administered to sheep in Anglesey varied. In general 1-ml. capsules were given to ewes in the normal year, and 2 ml. either as 2 × 1-ml. or 2-ml. capsules in 1958–59, but 7 out of the 44 farmers who used carbon tetrachloride, on occasions had administered doses of 5 ml. to sheep usually with 10 ml. of liquid paraffin. Four farmers had recently injected their sheep with a mixture of carbon tetrachloride and Diloma* supplied by the veterinary surgeon, and were well pleased with it. Hexachloroethane was not favoured due to its higher price and the difficulties involved in dosing large numbers of ewes. Again, there were no reports of carbon tetrachloride being toxic to sheep.

Very few farmers were prepared to comment on the effects of dosing ewes at tupping and lambing times. Almost all did not dose during these periods in case something untoward might happen. Only 4 farmers—all in Cornwall—had decided views on the subject of dosing at tupping time, 3 that it had no effect, 1 that it had. Only 3 farmers said they either had dosed or were prepared to dose through lambing time, and as might be expected two of the three were among those who said dosing had no effect on the ewe at tupping time.

Other Methods of Control

There was a much greater awareness in Anglesey of other measures which could be taken to control the disease than in Cornwall. Of the 47 farmers in Cornwall who dosed their sheep only 4 gave a positive answer to the question "What other measures do you take?" All 4 said that they tried to keep sheep on the driest fields. The majority of the other 43 considered that they would not have had trouble in 1958–59 had they dosed earlier or more frequently. Only 3 farmers expressed the opinion that something more than dosing was required to control the disease in the "bad year" (2 having dosed 8 times during 1958–59).

In Anglesey, of the 44 farmers who lost sheep during 1958–59, 2 said that they had used copper sulphate to kill snails, 5 either had or were draining wet fields and 7 (including 1 who was also undertaking drainage) tried to keep sheep out of the wettest fields in winter. Of particular interest were 2 replies, one to the effect that the sheep had access to a wet marsh in winter, but that it was not proposed to restrict this access, the other by a farmer who lost all his ewes in 1958–59 but still maintained that all his land was dry and fluke free.

The limitations of dosing in the control of fascioliasis were not generally appreciated except by those farmers in Anglesey who treated their ewes with 5 ml. of carbon tetrachloride when outbreaks of acute disease were prevalent.

TABLE III
SHOWING THE TYPE OF ANTHELMINTIC USED FOR DOSING SHEEP

Anthelmintic Used	Per cent. of Farmers in Cornwall	Per cent. of Farmers in Anglesey
Hexachloroethane	75	2
Carbon tetrachloride	2	80
Proprietary preparations	21	18
Alternate carbon tetrachloride and hexachloroethane ...	2	0

* Diloma Compound D: Shell Petroleum Co., Ltd.

Black Disease

Although it proved impossible to separate losses in sheep due to black disease from those due to acute fascioliasis in 1958–59 it was obvious that black disease was much more of a problem in Anglesey than in Cornwall. There was a greater awareness of the disease amongst the farmers in Anglesey, 6 of whom vaccinated their ewes regularly, a further 2 doing so in 1958–59.

Cattle

Of 104 farmers who kept cattle, 8 in Anglesey and 2 in Cornwall had losses in 1958–59. Only 3 farmers—all in Cornwall—dosed cattle each year, one dosing all stock including milking cows. Two farmers dosed young stock when brought in for the winter. Ten farmers in Cornwall dosed individuals each year if they considered it necessary, a further 2 doing so in 1958–59. In Anglesey, no farmer dosed cattle as a yearly routine, but 13 dosed individuals in 1958–59. With one exception all used hexachloroethane, the exception being a farmer in Cornwall who gave 4 or 5 1-ml. capsules of carbon tetrachloride. He reported that some animals, although temporarily affected by this treatment, quickly recovered.

Discussion of Survey

The results of this survey cannot be assumed to be representative of the country as a whole or even the counties of Cornwall and Anglesey because relatively few farmers in 2 small areas were questioned. It is probable, however, that the problem of fascioliasis in these two areas is more serious than elsewhere, so that control measures should at least equal, if not be more intensive than those undertaken elsewhere. Unfortunately there is ample evidence in the results of this survey to show that there is a great gulf between the recommendations for controlling the disease and those which farmers put into practice. Apart from dosing sheep, few of the farmers interviewed applied other recognised methods of control. Even in the dosing of sheep there was a wide range of practice both in timing and frequency, with a majority of farmers not dosing as frequently as recommended.

On the evidence available from this survey it is almost impossible to determine whether the recommendations to control the disease which are usually made are capable of leading to full control in a "bad fluke year." What is certain, however, is that the measures which farmers applied in 1958–59 did not give adequate control, even on those farms where dosing was used extensively. In theory, those flocks treated most frequently should experience the least losses, but such theory presupposes that the incidence of disease, the rate of stocking and the timing of dosing is the same on all farms. Since these assumptions are not valid, this relationship cannot occur. In fact, on most farms in 1958–59 additional doses were given only when losses continued after normal treatment had been administered, so that there was a tendency for the frequency of dosing to increase with increasing losses. On some farms, however, in spite of heavy losses no practical attempt to control the disease was made, hence the absence of any precise relationship between the severity of losses and the frequency and timing of dosing.

Although farmers in both counties were not prepared to dose their stock as usually recommended, those in Cornwall dosed their ewes more frequently and later in the season in 1958–59 than did Anglesey farmers. Yet Anglesey farmers on the whole seemed better informed about the disease and control measures than those in Cornwall. The fact that farmers in Cornwall appeared more ready to seek and accept the advice of their veterinary surgeon than those in Anglesey goes some way to explain the difference in dosing. It also accounts for the wide use of hexachloroethane in Cornwall.

No simple explanation can be found for the fact that most farmers neither dosed their ewes nor applied other control measures as recommended. There is no doubt that many as a rule were not willing to undertake more than a minimum of control measures, accepting the risk of heavy losses in the occasional year. In most farmers there seemed to be an inborn reluctance to attempt control of disease by methods other than killing the causal organism in the place where it is doing its damage. Perhaps this is why all farmers habitually look forward to new preparations for treating stock, and why the majority of questions at farmers' meetings on fascioliasis concern dosing. Yet in spite of this keen interest in dosing, many farmers remain fearful of possible ill-effects on their ewes if they dose at times other than those to which they are accustomed. The occurrence of losses from acute fascioliasis within a week of dosing—a not uncommon event during 1958–59—did not inspire confidence in the effectiveness of the drugs in use. Some farmers were ignorant of the value to be obtained by increased dosing, whilst others with the knowledge that standard treatments do not kill immature flukes concluded there was little point in administering extra doses when losses from acute fascioliasis were particularly high. In addition, there was evidence that some farmers were not prepared to discuss their own problems in detail amongst themselves, so that individual experiences of dosing sheep were rarely shared for the benefit of all. In these circumstances, it is not surprising to find that dosing was not fully implemented during 1958–59.

As for other control measures some farmers do not yet appreciate the need for them, being of the opinion that dosing if undertaken in time is the complete answer. Others are not convinced that they are both economic and practical to operate or, apart from drainage, reasonably effective in their results. Furthermore, it is useless to expect farmers to undertake each measure every year in case there happens to be an epidemic, yet to be effective some of these measures must be planned and put into operation before disease is apparent in stock. The fullest information and advice possible on the expected incidence of disease, its probable course, areas on the farm where disease occurs, and the appropriate control measures to apply must be available to farmers before they can be expected to implement such measures. This information is not

often available to the farmer, yet it is obvious from this survey that of those farmers who were aware of all methods of control, few had the necessary technical knowledge to apply them precisely to their best advantage.

This analysis of the situation shows that more information about liver fluke disease and its control must be made available to farmers, who in turn must be prepared to undertake more intensive control measures if future epidemics are to be controlled. The establishment in Wales of demonstration farms where these control measures are co-ordinated with estimates of the incidence of disease may be an important development in showing farmers what can be achieved in control.

Meanwhile it is essential to ensure that the measures which farmers are willing to undertake at the present time (namely dosing sheep) are used to the best advantage. It is apparent from the survey that the majority of farmers dosed their sheep both in the normal year and in 1958–59 with fewer than the recommended number of doses. Since this dosing was undertaken over many months, it follows that individual farmers employed a variety of practices and it is unlikely that each dose produced an equally beneficial effect on the sheep. There is evidence that the most common practice (that of dosing in September before the ewes go to the ram, with a further dose in November or December) has been evolved in accordance with the recommendations not to dose at tupping time or near to lambing. There is no evidence to show that this practice has been evolved because ewes are in greatest need of treatment at these times. For instance, in 1958–59 the peak of losses from acute fascioliasis did not occur until the beginning of December when dosing on many farms had ceased. Nevertheless it must be recognised that farmers would not have developed their own individual practices, *e.g.* dosing ewes after lambing in April, if they did not believe these to be useful. It seems appropriate, therefore, to examine critically both present recommendations and practice, bearing in mind the fact that many farmers are not prepared to dose their ewes more than twice in the normal year and 3 times in the bad year such as 1958–59. Although this examination is based on data for Anglesey alone, it is considered that the course of events is not markedly dissimilar on lowland farms in other flukey areas of the country.

Present Recommendations for Dosing Sheep

Both carbon tetrachloride and hexachloroethane are recommended for dosing sheep in Britain to prevent chronic fascioliasis. Carbon tetrachloride is perhaps most widely used, and the usual recommendation is to dose with 1 ml. at monthly intervals throughout autumn and winter, suspending the treatment during the tupping season and ceasing altogether some 6 weeks before the start of lambing. The recommendation to suspend treatment during the tupping season is due to the possibility that dosing at this time may interfere with conception in the ewe, whilst cessation of treatment before lambing is designed to prevent abortion in ewes in advanced pregnancy. It is also widely recognised that treatment of all sheep with carbon tetrachloride involves the risk of occasionally poisoning animals, and farmers are advised to take the precaution of test dosing a few individuals before treating the entire flock and starving all sheep before treatment with a view to reducing this risk.

The value of a 1-ml. dose of carbon tetrachloride in treating sheep suffering from fascioliasis was demonstrated in Britain by Montgomerie (1928) who clearly showed that at this dosage flukes were not killed until they had been parasitic in the sheep for 10 to 11 weeks, *i.e.* not until they reached sexual maturity. In further experiments, he showed that larger doses of carbon tetrachloride (5 and 10 ml.) were still more effective in controlling the disease since they also killed younger flukes as long as they were not less than 5 to 6 weeks old. Although the survey shows that doses of 5 ml. of carbon tetrachloride may be given to sheep on some farms in Anglesey, the standard recommendation remains at 1 ml. perhaps because of the presumed increased risk of poisoning which might accompany the use of the larger dose.

Evaluation of Routine Treatments

As has been outlined earlier, treatment with 1 ml. of carbon tetrachloride will have no appreciable effect on the fluke population in a sheep until about 12 weeks after the animal first ingests metacercariae. Thereafter, if the sheep is to be kept free from adult flukes, dosing has to be repeated until at least 12 weeks have elapsed after viable metacercariae have ceased to be ingested.

Information regarding the appearance of the infection on the herbage in Anglesey during the period 1948–57 has been given by Ollerenshaw and Rowlands (1959) as a result of which it is possible to suggest when routine dosing should have commenced in any particular year during that period. Experiments still in progress show that metacercariae may remain viable on the herbage for several weeks in summer and several months in winter, but the most useful indicator for determining when dosing should have ended is the time of cessation of outbreaks of the acute form of the disease. (Losses from so-called "acute fluke" being due to the presence in large numbers of immature flukes in the liver tissue.)

The records of *post-mortem* examinations at the Veterinary Investigation Centre, Bangor, supply information regarding the incidence of acute fluke disease in sheep examined from Anglesey during the period 1948–57 (see Ollerenshaw & Rowlands, 1959).

If dosing with 1 ml. of carbon tetrachloride is to be fully effective against the adult fluke it can be deduced that treatment must commence 12 weeks after the herbage first becomes infected and must continue at regular intervals until at least 8 weeks after losses from the acute form of the disease come to an end. This deduction forms a basis for assessing the value of routine treatments as practised at present, and Table IV indicates those months of the years 1948–57 when treatment would have been

TABLE IV
A TIMETABLE OF MONTHLY DOSING COMMENCING WITH THE TREATMENT OF THE WINTER INFECTION OF 1947 AND TERMINATING WITH THE SUMMER INFECTION OF 1957

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1948												S
1949	S	S	S	S					W	W		
1950												S
1951	S	S	S	S	S				W	W		
1952	S	S	S						W	W		S
1953 ...	S	S	S						W	W	W	S
1954	S	S	S	S	S	S			W	W	W/S	S
1955	S	S	S	S	S	S	S	W	W	W	W	W
1956	S	S	S									S
1957	S	S	S						W	W	W	W/S
1958	S	S	S	S								

S. = Treatment of Summer Infection
W = Treatment of Winter Infection.

efficacious. In years when an infection passed on to the herbage but was not sufficiently intense to cause outbreaks of the acute form of the disease 2 treatments are shown, 12 and 16 weeks after the herbage first became infected.

In any year, infection of the herbage may arise from 2 sources (see Ollerenshaw, 1959). A summer infection arises from snails infected during summer, the cercariae passing on to the herbage in late summer and autumn, and producing losses in sheep due to the acute form of the disease in late autumn, winter and early spring. The winter infection is derived from snails infected in late summer and autumn, the infection overwintering in the snail and passing on to the herbage in late spring and early summer of the following year. Losses due to this infection follow in late summer and early autumn.

Treatment with carbon tetrachloride may combat either or both of these infections, and details as to which infection is being controlled by any particular treatment are included in Table IV. For example in 1957–58 treatments would have been necessary in September, October and November to control the winter infection and from January to April to control the summer infection, whilst a treatment in December would have been of value against both the winter and summer infections.

From this table it is evident that although dosing in most months of most years is of benefit to sheep there is a clear indication that it is more valuable in some months than in others. Usually treatment in September, October and November satisfactorily controls the less important winter infection. Dosing in December, besides controlling the last of the winter infection, begins to reduce the more important summer infection, and this treatment is continued on a few farms by dosing carried out in January and February. Except on those farms where a dose is given after lambing in April, most of the summer infection escapes treatment owing to the abrupt termination of dosing in December. This infection, therefore, remains in the ewe throughout the following summer and is treated by the first dose of the following season.

More direct evidence of the presence of this infection in ewes throughout the summer was obtained during 1958. Random samples of faeces from ewes on 10 farms in Anglesey were examined for the presence of fluke eggs. Fascioliasis was known to exist on all farms, and the ewes had been dosed during the previous autumn according to the common practice. The result of this sampling is shown in Table V. Not only is a high rate of infection recorded, but, and this is even more important, a number of sheep were found to be clinical cases of chronic fascioliasis in need of treatment.

The observations outlined above indicate that ewes are in need of treatment at lambing time. Oral dosing with carbon tetrachloride or hexachloroethane at this time of the year, as has been shown in the survey, is not acceptable to most farmers, but a treatment after lambing in April or early May might prove acceptable provided such treatment had no untoward effect on the milking ewe. The experiences of the few farmers in Cornwall who include dosing in April after lambing in their practice suggest that dosing at this time is no less safe than at other times. Sheep so treated are likely to remain free of adult flukes throughout the summer, and will then be in better condition to combat a further invasion of flukes the following autumn. Furthermore, this treatment would be additionally valuable if it could be shown that the concurrent effect of reducing the fluke egg output during late spring and summer significantly reduced the subsequent infection of the host snail. As has been shown by Rowcliffe and Ollerenshaw (1960) this period of the year is the most critical time for infection

TABLE V
RESULTS OF SAMPLING EWES ON 10 FARMS IN ANGLESEY IN THE EARLY SUMMER OF 1958

Eggs per gram of faeces	0	1—50	51—100	101—200	201—300	301—400	401—500
Percentage of total	15	57	11	9	4	3	1

The Use of Pregnancy Diagnosis in the Management of Extensive Beef Herds

BY

H. G. OSBORNE

**Department of Veterinary Clinical Studies,
Veterinary School, University of Queensland,
St. Lucia, Brisbane, Australia**

SUMMARY.—The use of pregnancy diagnosis as a routine in the extensive beef cattle industry is discussed from the viewpoint of (1) *general management,* (2) *infertility syndromes, and* (3) *clinical investigations and experimental procedures.*

In general management, pregnancy diagnosis can be used to group cows to facilitate handling during drought, calf handling procedures, cattle tick control and controlled mating.

The term "salvage" is used to define procedures, usually based on pregnancy diagnosis, which will help recoup financial losses due to infertility, pending final solution of the problem.

In clinical investigations and field trials the grouping of animals according to their lactation history over the preceding 2 years is possible as a result of a single examination and the use of this procedure is recommended.

Introduction

THE diagnosis of pregnancy in cattle by palpation of the genital tract *per rectum* has been a standard procedure in dairy and stud beef herds for many years. It has been used primarily for the diagnosis of infertility syndromes and the diagnosis of uterine or ovarian disease in individual animals. McFarlane (1955) reported on the use of pregnancy diagnosis as a routine in range beef herds and he

---

A Survey and Appraisal of the Methods Used by Farmers to Control Fascioliasis.—*Concluded.*

of pastures to occur, since temperatures are then favourable for the development of the fluke egg. It must be remembered, however, that at the present time cattle are rarely treated on most farms so that a continuous supply of fluke eggs is ensured irrespective of the treatment given to sheep.

Consideration of Table IV shows that the need to dose sheep varies from one year to another, and that the most efficient control of the disease is likely to occur where the intensity of dosing parallels the severity of disease. To this end, press notices have been issued by the Ministry of Agriculture for the past three years indicating the months when dosing would be of greatest value. Although a rigid approach to dosing with a fixed routine each year is not the ideal approach it is possible to suggest practices which in most years would constitute an improvement on those used at present. The end of December and April or early May are suggested times for a routine involving two doses of carbon tetrachloride and November, January and April or early May for one involving 3 doses.

In conclusion, some comment must be made on the need for further investigations on the precautions to be taken when dosing stock, and the more drastic treatment of sheep with 5-ml. doses of carbon tetrachloride when outbreaks of acute disease are prevalent. Unless some form of treatment is discovered which remains active for some months against the parasite in the final host, the need to dose ewes at tupping and lambing times and in advanced pregnancy will remain, since it is during the period when the ewe is in lamb that it acquires its heaviest infection. Although a few farmers are prepared to dose at these times, the majority follow general practice and refrain from doing so. Little experimental evidence is available either in support or contradiction of these recommendations, but the experience of the few farmers who have dosed at these times suggests that if reasonable care is taken (particularly in handling ewes in lamb) the danger is not as great as has been supposed.

Confirmation that dosing after lambing in April or early May is no less safe than dosing in autumn and early winter would also be of value. In addition, investigations into the frequency of losses from carbon tetrachloride poisoning similar to those reported by Harrow (1959) for hexachloroethane in cattle and sheep might confirm the impression gained from this survey that the danger of poisoning from carbon tetrachloride has been much exaggerated.

The recent introduction of hexachlorophene which is recommended as being safe to use on both sheep and cattle at any time of the year may provide an asnwer to some of the problems discussed above.

Acknowledgments.—The authors would like to thank all those farmers who were interviewed during the survey for their willing co-operation. Thanks are also due to Miss R. Barber for work during the course of the survey. They are also very grateful to Dr. S. B. Kendall for his helpful suggestions during the preparation of this paper.

References

HARROW, W. T. (1959). *Vet. Rec.* **71.** 111.
MONTGOMERIE, R. F. (1928). *J. comp. Path.* **41.** 191.
OLLERENSHAW, C. B. (1959). *Vet. Rec.* **71.** 957.
———, & ROWLANDS, W. T. (1959). *Ibid.* **71.** 591.
ROWCLIFFE, S. A., & OLLERENSHAW, C. B. (1960). *Ann. trop. Med. Parasit.* **54.** 2, 172.

recommended its use in their management to allow the sale of non-pregnant breeders so that 100 *per cent.* of the cows carried over the winter period would be pregnant.

During the course of veterinary practice amongst beef cattle in the period 1957 to 1961 the use of pregnancy diagnosis as an instrument of management in extensive beef herds has been investigated. The general area in which this work was carried out, the procedure of examination of a herd and the use of this technique in the investigation of infertility syndromes has been reported (Osborne, 1960). The properties on which observations have been made graze 1,000 to 1,500 breeding cows on 15,000 to 30,000 acres and are worked by 3 to 5 men. This situation is referred to as "extensive" management.

The manner in which pregnancy diagnosis may be used to simplify property management or to render it more efficient is considered under 3 headings, namely: (a) in general management, (b) in management with particular reference to infertility syndromes and (c) in clinical investigations and field experimental procedures.

Pregnancy Diagnosis as a General Management Practice

Under this heading the most important use of pregnancy diagnosis is to enable paddock grouping of breeders according to stage of pregnancy. This is advantageous in herd management under drought conditions, to simplify calf handling operations, to facilitate routine control of some infectious diseases, for example, cattle tick infestation, and to allow more orderly mating. In addition it establishes the pregnancy status of females purchased or offered for sale.

At the time of routine pregnancy diagnosis a herd can be classified into as many groups as there are paddocks on the property in which they can be depastured. Usually it is convenient to make 3 groups, namely, non-pregnant (or less than 2 months), 2 to 5 months, and 6 months or more pregnant. The division of the herd into these 3 groups is practicable on most properties.

Under drought conditions most herds are spread over as large an area as possible and handled as little as possible. Regular paddock inspections are made and the weakest cows are drafted to a hospital area and given supplementary feeding. If the stage of pregnancy is known in advance it should be possible on most properties to provide differential treatment in terms of quality of paddock, intensity of supervision and level of supplementation to the group which needs it most.

The second advantage of grouping is to concentrate the calf drop in certain paddocks at definite times. This allows for better supervision of the herd during the calving period and all calves can be branded and weaned in a single operation when all are close to the ideal age.

The rational control of *Boophilus microplus* infestation in those areas where this parasite is enzootic involves the use of dipping and pasture spelling (Wilkinson, 1957). The presence of young calves is a hazard to both mustering and the operation of dipping. As the calving season usually extends over a period of 6 months and coincides with the season of highest incidence of infestation, it is obvious that the use of paddock grouping according to stage of pregnancy would allow "strategic" dipping of each group immediately prior to calving. If these cattle are then run in a spelled paddock, dipping in the presence of young calves is avoided.

The use of a short mating period and consequently a concentrated calf drop is desirable from many points of view, including branding and weaning operations, and the selection of animals on the basis of growth rate. Mating periods can be shortened to nine weeks or perhaps less with safety provided that pregnancy diagnosis and subsequent remating can be carried out if necessary.

Pregnancy Diagnosis with Particular Reference to Infertility Syndromes

The number of cows pregnant and the number of calves subsequently branded and weaned are important guides to the efficiency of production. These records, together with the number of animals finally sold or added to the breeding herd, should be kept as a routine procedure on cattle properties. The results of pregnancy diagnosis are of major importance, as, in many environments, the greatest losses in production, from a numerical standpoint, occur between mating and mid-pregnancy. For example, on 2 large properties records over 3 years showed a loss of 15 to 20 per cent. from mating to mid-pregnancy (including lack of oestrus), whilst losses from mid-pregnancy to calf branding were approximately 5 per cent. (Osborne, unpublished).

Where an infertility problem exists, the records of pregnancy diagnosis can be used in several ways: to define the problem by establishing the extent of losses before and after mid-pregnancy: to indicate paddock or breed differences in conception rate or differential conception rates between lactating and non-lactating cows: to establish a basis for sampling the herd for specific diseases. Each of these factors has been discussed previously (Osborne, 1960). Another important use of pregnancy diagnosis is to separate the non-pregnant animals from the remainder of the herd in order that they may be given special treatment to recoup losses from a low initial conception rate. This process may be termed "salvage."

Salvage may be attempted in one of three ways, namely:—

(1) By sale.
(2) By remating.
(3) By not weaning the calf currently at foot.

Salvage by sale was advocated by McFarlane (1955) in New Zealand. He recommended the sale of non-pregnant cows before winter to avoid carrying unproductive beasts over the period of feed shortage. An associated technique was to mate an excess of heifers to replace the animals sold. This allowed the normal complement of females, all of them pregnant, to be carried over the winter to calve in the spring.

The mating of an excess of heifers, with subsequent

culling of those not in calf, is a simple system which could be applied on any property where the conception rate in this group averaged 80 per cent. or more. The slight reduction in selection pressure for other characteristics which would be involved in this procedure would be compensated by the gain from the birth of more calves. The culling of non-lactating adult cows is not a problem unless the number involved is such that replacements cannot be provided.

A problem exists in the case of lactating cows. In some areas these will be in poor condition and may have a calf at foot which is too young to wean. Consequently they cannot be culled economically. When these cows approach marketable condition in the following season, they may be the most fertile animals in the herd (Osborne, 1959).

As a result of these considerations, salvage by sale is recommended in the case of heifers and cows which have not reared a calf in the current season. In the case of cows which have just reared, or are rearing a calf, a decision has to be made according to local conditions, whether to sell, or to attempt salvage by other methods.

Remating and non-weaning are the methods of salvage normally applicable to lactating cows. Remating may be immediate or delayed to allow calving at a more opportune season. In one area under study it is generally believed that the period from June to December is better for calf birth and subsequent growth than the period from January to May. Consequently, if the general mating of a herd is in January-February-March, pregnancy diagnosis is carried out in May and remating delayed until September. For herds mated in September-October-November, pregnancy diagnosis would be in February and remating would take place at once. It is obvious that such programmes have to be suited to the area concerned.

Salvage by non-weaning is based on the principle that if a lactating cow is not pregnant, she is at least feeding a calf. This is a rather hazardous concept because some cows are dry or almost dry at the time of examination whilst others may continue to lactate to the detriment of subsequent conception. The theoretical justification for non-weaning is that a calf weaned at the normal time may be sold as a "store" beast at 15 months old whilst an unweaned calf of the same age may be sold as a "vealer" for 50 per cent. more money. On this basis a cow rearing 2 "vealers" in 3 years would return as much profit as the cow which reared 3 "stores."

On one occasion, in an area where cattle are subjected to nutritional stress, an attempt was made to "re-mate" and "non-wean" simultaneously, with indifferent results. It was apparent that many of the cows weaned their calves during the winter and did not rear "vealers" and the conception rate on remating in September was poor. It was concluded that in the area involved, a system of early weaning would ensure the best results from remating and that, in general, remating was a better method of salvage than non-weaning.

Pregnancy Diagnosis for Herd Grouping in Clinical Investigations and Field Experimental Procedures

One of the features of beef cattle herds, kept under extensive grazing conditions in Australia, is that they are seldom handled and individual histories are rarely available. This presents a problem when clinical investigations are undertaken on a herd basis and when animals are to be selected for field trials.

Using the records obtained from whole herd pregnancy diagnosis it is possible to divide a herd into groups with a similar lactation history for both the present and the immediate past season. When this is done a classification of morbidity or mortality according to groups based on previous lactation experience is a valuable contribution to the history of any syndrome under investigation. Further, when allocating animals to experimental groups, selection can be made from within a single "lactation classification" or animals from a "lactation class" can be uniformly distributed amongst the group.

The method of division of a herd into classes is to mark animals, according to their state of lactation and pregnancy, at the time of pregnancy diagnosis. The usual groups are set out in the diagram below.

NON-PREGNANT

Heifers not previously mated.

Dry cows. These did not rear a calf in the present season.

Wet cows. These did rear a calf in the present season and have recently weaned it or it is still at foot.

PREGNANT

Heifers not previously mated.

Dry cows. These did not rear a calf in the present season.

Wet cows. These did rear a calf in the present season and have recently weaned it or it is still at foot.

In 6 months from the time of examination all the pregnant cows will have calved. Assuming that none of the groups have been disposed by sale (*e.g.* salvage operations) it will be possible to recognise groups of cows for which the lactation history over two seasons is known. There will be five "lactation classifications," namely:—

(1) Cows which have not reared a calf for 2 successive years. (Dry—Dry.)

(2) Heifers which have failed to rear a calf in their first breeding season. (Dry heifer.)

(3) Cows which are non-lactating but reared a calf in the previous season. (Wet—Dry.)

(4) Cows which are lactating but did not rear a calf in the previous season. (Dry—Wet.)

(5) Cows which are lactating and also lactated in the previous season. (Wet—Wet.)

The groups are arranged in approximately the order of increasing exposure to nutritional stress. If it is shown that any syndrome selectively affects cows in Group 5 (Wet—Wet) this would be regarded as strong evidence for the operation of nutritional

(*Concluded at foot of col.* 1, *p.* 1124)

Treatment of "Dry Coat" in Thoroughbreds with Vitamin E

BY

J. H. MARSH

The Straits Racing Association, Singapore and Malaya

Introduction

THE condition of "anhidrosis" or "dry coat" as it is commonly known, is of paramount interest in countries with a hot, wet climate where Thoroughbred horses are raced, imported animals being particularly susceptible. It is a well-known condition in Malaya, Indonesia, India, Ceylon, and is occasionally met with in the United Kingdom, parts of Australia and South Africa. It puts a great strain on the horses and often results in great financial loss to the owner. This condition has been known for many years and was first reported by Wright and Tull in 1925, and later by MacGregor in 1935. Short articles have appeared from time to time since, and finally in 1957 Lovatt-Evans, Smith, Ross and Weil-Malherbe discussed some of the physiological implications.

In Malaya most Thoroughbreds are imported. There are very few race-horses bred locally, but of those bred there since 1954 (4 in all) from imported mares and stallions, all were nearly "dry" by the time they were yearlings.

It is believed that continual feeding on corn without a run at grass renders a horse more susceptible to the condition in Malaya than in more temperate climates. It would appear, therefore, that the condition may be caused by a combination of climatic conditions, excess of concentrates, and lack of an annual run on good pasture in a cool climate.

Symptoms

The onset of the condition is easily recognised by those familiar with the condition. The horse may have only landed in the country a few weeks when he shows signs of oncoming dryness, or he may have been there for years. The condition is preceded by abnormal "blowing" with exaggerated dilatation of the nostrils, and laboured breathing. Sweating at this stage is restricted to the following areas: neck, base of the mane, jowl, base of the ears, and between the hind legs. After a short while, as the condition progresses, these areas become "dry." The last area to lose the capacity to sweat is usually the crest of the neck.

The coat at this stage becomes dull, with loss of lustre, and general scruffiness is seen. The face and other parts of the body in many cases shows loss of hair, which tends to fall out wherever friction is applied, such as in the shoulder region and behind the saddle where contact is made with the jockey's boot when riding "hands and heels."

The affected horses usually lose bodily condition and become unthrifty; the systolic blood pressure is high and the pulse accelerated (Lovatt-Evans *et al.*, 1957). The body temperature is raised, even at rest, and after exercise may reach 105° to 108° F. After a gallop there is marked vascular engorgement of the skin. Slight exercise is enough to provoke severe dyspnoea and tachypnoea (up to 150 per min.). Kidney action is increased (polyuria) to compensate for reduced sweating (Arnold, 1950) and the urine may contain albumen and casts (Ross, 1957).

The performance of animals suffering from "dry coat" varies, but in general it becomes more disappointing as the condition progresses. I have seen some very "dry" horses put up remarkable performances to win races, and then collapse from cardiac failure when returning to the unsaddling enclosure.

When an owner finds his horse going "dry" he has two choices; either to put him into an air-conditioned box where the temperature is maintained at about 75° F. and humidity is kept low, or to send him up to a hill station at Cameron Highlands, which is about 3,800 feet above M.S.L. and where relative humidity is low and the temperature averages about

---

The Use of Pregnancy Diagnosis in the Management of Extensive Beef Herds.—*Concluded.*

factors. Conversely, if the syndrome is seen equally in all groups it would suggest that nutritional factors are not of major importance.

In the design of field experiments the same principles apply and are particularly important when nutritional factors are involved. It is clear that in many environments, a difference in lactation history over the previous two seasons is more important than a difference in the age of cows. Also, in some cases it may be desirable to select an experimental group that is most likely to respond to treatment.

Consequently, depending on circumstance, experimental groups should be selected in such a way that *either* equal numbers of animals from each "lactation classification" are present, *or* all the experimental animals are drawn from a single "lactation classification." To apply this principle, cows can be identified into their groups at the time of pregnancy diagnosis and allocated to experimental groups 6 months later when all have calved, or experimental groups may be selected at the time of pregnancy diagnosis and individuals which subsequently lose a calf can be discarded later.

References

McFARLANE, D. (1959). "Sheepfarming Annual, 1955." P. 66. Massey Agricultural College, Palmerston North, New Zealand.

OSBORNE, H. G. (1959). *Aust. Vet. Jour.* **35**. 326.

———. (1960). *Ibid.* **36**. 164.

WILKINSON, P. R. (1957). *Aust. J. Agric. Res.* **8**. 414.

75° F. The results obtained from either of these conditions are variable, but if the horse is removed from the air-conditioned box or returns from the hills, he reverts back to his original state of "dryness," after a period of some 2 to 3 months.

Composition of Sweat

A short consideration of the composition of the sweat of the horse compared with man emphasises the fact that it is more important that a horse should sweat.

	PH.	S.G.	Water Content	Protein	Urea	
Man	4.2-7.5	1.002-1.003	99%	—	—	(Best & Taylor)
Horse	8.5	1.02	94.4%	2.75%	16%	(Duke)

Sweat is a watery secretion poured out upon the surface of the body to assist, upon evaporation, in cooling the body. In man it cannot be considered so important an excretion, for it is nearly all water. In the horse, on the other hand, its higher specific gravity and its urea content require that it be regarded somewhat in the light of an excretion. In animals that sweat, a reciprocal relationship exists between the skin and kidneys in the elimination of water. In pathological conditions of the kidney, the skin may take over a considerable share of that organ's work.

Treatment

There is no specific treatment for this condition, since it is not known what causes dysfunction of the sweat glands. Use of various drugs on a "trial-and-error" basis has failed to reveal any which can prevent or improve the condition. To date, the only solution has been to put the animal into an air-conditioned box or to send it up to the Cameron Highland Hill station. These methods certainly give 50 per cent. successful results, but on removing the animals from these environments, affected horses revert to their original state of dryness or partial dryness. Air-conditioned boxes are expensive to erect and not many of them are yet available except at one or two race-courses in Malaya, and for horses affected at other centres they are not available. The Cameron Highlands also have a drawback in that horses must be down from the hills 3 weeks before they are allowed to race.

Vitamin E (Natural Alpha-Tocopherol)

I was first introduced to the possibilities of using vitamin E in the condition of "dry coat" by Lambert *et al.* in Dublin in 1957. While discussing the potentialities of this drug they were of the opinion that it might be the answer to this condition.

To date I have treated 97 cases suffering from "dry coat." Some of these horses had been very dry for periods of up to 18 months, and are now in varying degrees "free sweaters." A few horses have responded very poorly to the treatment. I estimate that I have had about 90 per cent. success. I am of the opinion that treatment was not given for a long enough period, or in large enough doses in some of those which failed to respond successfully.

In carrying out these experiments, I have approached them using the vitamin E under three different circumstances:—

(a) Together with air-conditioning.
(b) In the Cameron Highlands.
(c) Under ordinary stabling conditions.

The success and rate of recovery was in proportion to the order of circumstances named above.

Treatment consisted of the administration orally of 1,000 to 3,000 units of vitamin E daily for one month. This period is, in my opinion, too short a period to judge the full beneficial effects on any particular horse. Horses which have recently become dry recover more quickly than those in which the condition is well-established, whatever the conditions of stabling. The amount of vitamin E required appears to vary with the horse and the stage of the condition.

The first noticeable effect of this treatment on a "dry-coated" horse is the absence of the dilated nostrils and laboured breathing after work. The animal begins to lose his coat (which at this stage is dull and scurfy), and this is gradually replaced by a coat with a bright lustre. The bald patches on the face disappear, and the animal assumes a healthy appearance once more. Sweating commences on the neck and anal regions at first and, as recovery progresses, between the hind limbs and in the flank and saddle regions. The fact of getting rid of the secretions through their normal outlets should in itself be beneficial to the animal.

Racing Performances

It is natural to assume that a horse with good racing potentialities when dry, should show these to a greater extent when he begins to sweat. I have therefore noted here the performances of some of my patients since treatment:—

(1) "First Trick"—6-year-old, grey Irish gelding ("Magic Red"/"Mary's First"): First treated June, 1957. Had been dry for almost 2 years, not sweating anywhere. Treated under ordinary stable conditions. Now sweats fairly freely all over. Record of placings: 1, 9, 6, 10, 3, 1, 2, 3. Treatment has been repeated. The 3 poor performances were in heavy going which he dislikes.

(2) "Misty Line II"—5-year-old chestnut Irish gelding ("Momentum"/"So Happy"): First treated in July, 1957. Partially dry for some 11 months. Sweated freely for some 4 months. Treated under ordinary stabling conditions. Treatment not repeated. Record since treatment: 2, 1, 5, 8, 11.

(3) "Safe Venture"—3-year-old grey English gelding ("Kingstone"/"Becky Sharp"): Won a race in January, 1958, in Perak. Very dry. Sent to Cameron Highlands and treated there. Returned and sweated freely on neck, shoulder, and saddle regions. Record: 8, 3.

(4) "Sweet Dream II"—6-year-old, chestnut English gelding ("Dante"/"Katmandu"): First treated in January, 1958, in an air-conditioned box. Was almost completely dry. Treatment since repeated and is sweating fairly freely. Record since receiving treatment: 1, 1, 2, 7, 2, 1. Has been promoted from Class 2 to Class 1.

(5) "Motion Picture II"—7-year-old bay English gelding ("Seven Seas"/"Vi-Lee"): First treated in January, 1958, in an air-conditioned box. Treatment since repeated. Had been very dry and showed a staring coat. Now shows patchy sweating. Record: 6, 7.

(6) "Joe's Tipple"—6-year-old chestnut Australian gelding ("Doughboy"/"Celestial Spirit"): First treated late December, 1957. Almost dry. Treated and was sweating freely when he broke down in his joints and had to be fired. Only received one treatment and is still sweating. Only raced once since and was second, beaten by a short head.

(7) "Arctic Region"—5-year-old bay Irish gelding

(" Arctic Star "/" Lanai "): First treated in September, 1957. Was acid-fired at the same time due to tendon injury. Treated in air-conditioned box. Sweated freely but has since gone dry as treatment was not repeated. Ran second in a £500 race being beaten by a head (only race).

(8) " Amusement Park "—5-year-old chestnut Irish gelding (" The Cobbler "/" Enagh "): Had been very dry for the past 18 months. First and only treatment was in March, 1958. Sweated freely. Record since treatment: 5, 1, 4, 1, 1. Broke the Malayan Record over 5½ furlongs carrying 9 st. 9 lb. in 1 min. 3 4/5 sec. Won the Perak Gold Vase October in 1960. Value £2,000 to the winner plus a Gold Vase (value £500 approximately). Returned to England in 1959 where he beat " Right Boy " in a £3,000 race at Doncaster under the name " New World."

(9) " Mirzapen " — 5-year-old bay English gelding (" Mirzall "/" Penelope Ann "): Not sweating freely for some time. Treated April, 1958. Has had one race since treatment in July which he won.

(10) " Jara "—5-year-old bay Irish mare (" Hindostan "/" Madam Jitters "): First treated July, 1958. Coat which was very dull and dry has now got a beautiful sheen, and shows patchy sweating. Raced in August and was beaten by a head.

(11) " Powhatan "—5-year-old chestnut English gelding (" Mossborough "/" Ulania "): First treated July, 1958, for partial dryness. Has had one race late August which he won.

(12) " Gallant Emperor "—5-year-old chestnut Australian horse (" Emperor "/" Gallant Bess "): A difficult horse to get a reaction from and it was only after repeated treatment both in air-conditioning and under ordinary conditions that he started to respond to treatment. A very " pasty-chestnut " before treatment, but subsequently came up a deep colour. Won a £400 race in December, 1959.

(13) " The Aussie "—4-year-old chestnut Australian gelding (" Emperor "/" Woodwind "): Arrived from Australia full of prospects but in every way was somewhat of a failure. Became very dry shortly after arriving in Malaya. Responded very poorly to treatment under all conditions. Occasionally broke out in patchy sweating. Never won a race.

(14) " Billeen "—5-year-old brown Australian gelding (" Billet "/" My Colleen "): Responded very quickly to treatment possibly because the trainer realised in time that he was going dry. Treated solely under normal stabling. Raced 15 times in 1959 winning once and placed 9 times.

(15) " Irish Wit "—4-year-old brown Australian gelding (" Rock & Rye "/" Black Signet "): Responded well to initial course and on first two outings ran second and third. On his third outing ran second last in a field of 11. Treatment repeated about 6 weeks later in an air-conditioned box by day. Won a £250 race 5 weeks later when he was sweating freely.

(16) " Sovereign Flame "—4-year-old bay English gelding (" Grey Sovereign "/" Vestal Girl "): Responded well to treatment having been dry for some months in spite of the fact that he was housed in an air-conditioned box for some months. Commenced sweating some 7 days after first treatment and continued to improve on treatment.

(17) " Sporting Venture "—5-year-old chestnut Australian gelding (" Sans Tache "/" Legerdemain "): Showed rapid improvement at the start with marked improvement in his coat. As the treatment was not repeated he in time returned to partial dryness.

(18) " Jacmac "—5-year-old chestnut Australian gelding (" Nauplia "/" Hindas Glory "): Went dry within one month of arrival in this country, was immediately placed in air-conditioning. Seemed to improve but breathing always seemed laboured. The coat became somewhat staring and in general his condition deteriorated. He was put on to 2,000 units daily when his condition rapidly improved and he was sweating freely. He was then put on to a course of 4,000 units daily for a week.

(19) " Lindalou "—5-year-old brown Irish mare (" Langton Abbot "/" Winking Star "): A very good subject for the treatment as she had only just gone dry (all over). She responded well to treatment but every time administration stopped she commenced to go dry once more. Under treatment she won three races.

I have found that horses which have been treated and are recovering may go dry about 4 months after cessation of treatment. This is most important in treating these cases, and I must emphasise that maintenance doses should be continued, or courses of treatment repeated at intervals not exceeding 3 months.

Of the cases quoted above the conditions under which the horses were stabled are as follows:—

In air-conditioned boxes: Nos. 4, 5, 7, 8, 11, 12, 15, 16, 18 and 19.

In hill station: Nos. 3, 9 and 16.

Under ordinary conditions: Nos. 1, 2, 6, 10, 13, 14 and 17.

Some queries arise from these results:—

(a) Would the horses kept in the air-conditioned boxes have sweated without the treatment? Most probably " yes," but not to the same extent, or so quickly.

(b) What of those in the hill station? The response varies with the patient more so than with those in (a). There are horses that pay regular visits to the hill station but sweat very little. I would say that without treatment these would not have sweated very much.

(c) What of those horses kept under ordinary conditions? It is my firm opinion that these horses would have gradually gone drier and drier.

Discussion

We have not, by any means, solved the problem of " dry coat " which affects only some animals housed and fed under the same conditions as hundreds of other horses of the same type. Why should some go completely or partially dry when others sweat freely? The introduction of vitamin E has, however, alleviated the strain on some and would appear from the results to be a step in the right direction. One important question which arises is why should vitamin E have this affect? Why when sweat glands are stimulated once again do they revert back to their previous state of dysfunction unless the drug is repeated? Answers to these queries are at present not possible and must await further work. The considerable benefits which have resulted from the administration of vitamin E are, however, in my opinion, convincing and they may stimulate further thought and effort on the part of physiologists and veterinary surgeons concerned with this problem of the non-sweating horse.

Acknowledgments.—I would like to express my appreciation to Mr. N. H. Lambert, M.R.C.V.S., and Miss E. Parkhill, M.R.C.V.S., Dublin, for their advice and encouragement throughout these experiments. To Professor Wm. C. Miller, M.R.C.V.S., F.R.S.E., of The Equine Research Station, Newmarket, for his advice in writing this paper; to Messrs. Webber & Co. for the supply of Natural Vitamin E at a greatly reduced rate; to the owners and trainers in Malaya for their co-operation, without which I should not have been able to carry out these tests.

(*Concluded at foot of col. 1 opposite*)

B.V.A. Council Meetings

LAST MEETING OF COUNCIL FOR THE YEAR 1960-61

A MEETING of the Council of the British Veterinary Association was held at Wadham College, Oxford, at 4.30 p.m. on Sunday, September 3rd, 1961.

The President, Mr. S. Jennings, was in the chair, and the following members were present:—

Mr. A. G. Beynon (Junior Vice-President), Dr. P. S. Blackburn, Miss W. M. Brancker, Mr. A. S. Chapman, Brigadier J. Clabby, Messrs. P. E. Curtis, T. C. Denholm (Hon. Secretary), A. C. Dixon, J. B. Edwards, J. Edwardson, Miss M. J. Freak, Messrs. I. G. George, F. A. Gordon, O. Graham-Jones, Lt.-Col. D. A. Green, Messrs. E. J. Heather, H. F. Hebeler (Hon. Treasurer), S. L. Hignett (Senior Vice-President), Dr. D. G. Howell, Messrs. J. M. Ingram, J. B. Johnston, J. M. S. Lucas, V. J. A. Manton, J. A. Pasfield, E. M. Pittaway, W. J. B. Robson, A. Steele-Bodger, D. L. Stewart, Mrs. G. M. Stuckey, Messrs. E. G. Sutton, A. Thomson, Miss O. Uvarov, Messrs. J. B. White, E. Wilkinson, A. L. Wilson, A. J. Wright.

Apologies for Absence

The General Secretary (Mr. Anderson) read apologies for absence from:—

Mr. A. J. Adams, Dr. F. Alexander, Dr. E. C. Appleby, Messrs. G. Atkinson, I. S. Beattie, A. J. Beeson, G. K. Buckler, Lt.-Col. G. N. Bushman, Messrs. E. R. Callender, J. A. Dall, Dr. G. O. Davies, Messrs. J. Forster, G. N. Gould, I. G. Hall, A. Hector, S. F. J. Hodgman, R. Hunnam, Bruce V. Jones, J. G. Loxam, Dr. R. F. Montgomerie, Messrs. D. F. Oliver, G. M. G. Oliver, A. D. Osborne, K. O'Sullivan, Dr. J. K. L. Pearson, Mr. G. S. Powley.

Minutes

The Minutes of the Council meeting held on July 21st, 1961, as published in THE VETERINARY RECORD, were confirmed and signed.

Membership

(a) *Obituary.* The Council stood while the General Secretary read the following names of members who had died since the previous meeting:—

M's.R.C.V.S.: P. F. Dolan (Co. Dublin); A. J. Hans (Branscombe); F.R.C.V.S.: Sir A. Olver.

(b) *Total.* The General Secretary reported that the number of members after the July, 1961, meeting, was 4,923.

On the motion of Mr. E. Wilkinson, seconded by Miss Uvarov, the following persons, whose names were read by the General Secretary, were elected to membership of the Association:—

M's.R.C.V.S.: Messrs. K. M. Butt (Bournemouth), A. T. Chesworth (Rochdale), B. L. Gardner (Sydney), A. Gibb (Whitley Bay), R. E. W. Halliwell (Jersey), J. K. Henwood (London, W.14), M. J. Hewlett (Bury), J. Knightly (Galway), W. E. Pearson (Bedford), W. A. S. Raine (Wootton Bassett), W. H. G. Rees (Stafford), G. E. Strawbridge (Barnsley), J. D. Temple (Devizes), J. F. Waldron (Offaly), J. E. Walker (Nassau), H. Graham Purchase (Cambridge, Commonwealth Register), J. M. Bunner (Fleet), D. J. Calvert (Kirkby Stephen), B. D. Hoskin (York), G. A. Leslie (Belfast), C. J. Mann (Falmouth), R. C. Shaw (Scunthorpe), J. R. Somerville (Crieff), and D. J. Thompson (Belfast).

Annual Report and Balance Sheet

Mr. H. F. C. Hebeler, the Honorary Treasurer, said that he thought Council would wish him to make a very short statement with regard to the accounts presented to them for submission to the Annual General Meeting the following day. It would be very obvious to those who had studied those accounts that the national inflation had at last caught up with the British Veterinary Association. For a considerable number of years the finances of the Association had depended to a very considerable extent on the extreme profitability of the Association's main publication, THE VETERINARY RECORD. While he would not wish to enter into any argument with the Chairman of the Editorial Committee about the continuing profitability of THE VETERINARY RECORD, it seemed to him that certain measures which had been taken to maintain that situation might be nullified by, for example, the increased postal charges which would come into force on October 1st and which, it was calculated, were going to add a sum of over £800 to the cost of distribution of THE VETERINARY RECORD.

In his estimation, after careful study of the accounts, it was quite wrong that the Association should depend to such a large extent on the profitability of a publication. The money which arose as surplus from this should, in his opinion, be put to other uses than the ordinary administration of the Association.

During the coming year, the Finance Sub-committee would, he had no doubt, be studying various ways of reducing the expenditure of the Association, and while he would not wish in any way to forecast their views, it appeared to him very unlikely that any great economies could be made without damaging the increasing work which the Association was doing. It seemed to him, therefore, that there was only one way of increasing the income of the Association in order to wipe out the deficits which appeared probable in future years and to set the Association on a sound financial base, and that way was not by depending on income from publications. He thought Council would wish him to have said that in advance of discussions that would take place

---

Treatment of "Dry Coat" in Thoroughbreds with Vitamin E.—*Concluded.*

References

ARNOLD, T. F. (1950). *Vet. Rec.* **62.** 463.

BEST & TAYLOR. "Human Physiology." 3rd ed. Page 1,053. Baillière, Tindall & Cox.

DUKE, H. H. (1935). "The Physiology of Domestic Animals." Comstock Pub. Coy. Inc., New York.

LOVATT-EVANS, C., SMITH, D. F. G., ROSS, K. A., & WEIL-MALHERBE, H. (1957). *Vet. Rec.* **69.** 1.

during the coming year in relation to the accounts as members saw them at the meeting.

Mr. A. J. Wright said that before the motion was submitted to Council, he hoped that what he had to say would be taken in a constructive way. The reports of the working of the Association were depicted excellently and it was a very good report; but he had felt for some time that it would be nice if chairmen were consulted on the reports of their committees before these were put into the annual report. He did not think the reports would be altered much, but it might be helpful to the Officers if his suggestion was accepted.

The President thanked Mr. Wright and said he thoroughly agreed with him. It was something that had already been considered, but there was a difficulty inasmuch as there was so little time after the July quarterly meetings before the annual report had to be in print; quite obviously, the report could not be prepared before the last day of the quarterly meetings. Before the Council's next session, there would be a suggestion that the Council meeting in July, 1962, might be held a little earlier; and it was to meet Mr. Wright's point that the suggestion was going to be made. It was only right and proper that the chairmen of the various committees should have, not only an opportunity of seeing draft reports, but he was hoping they might assist in drawing them up.

The annual report and balance sheet were then approved for submission to the Annual General Meeting.

Meeting Places for Annual Meetings of 1962 and 1963

(a) **The President** said that the Officers had already had two meetings with their Yorkshire colleagues, once in Scarborough and once a few weeks ago in York, and preparations were already in hand. Scarborough was going to be a fine place for the Congress. It had been decided the year before that Congress should be held there.

(b) **The General Secretary** read a letter dated November 29th, 1960, from the North Wales Division.

BRITISH VETERINARY ASSOCIATION—NORTH WALES DIVISION

Caerwern,
Gelli Road,
near Bangor, Caerns.
29th November, 1960.

Dear John,

Annual Congress 1963

It was unanimously agreed at our recent Annual General Meeting that, further to our letter of 17th November, 1959, this Division now extends a firm invitation to the B.V.A. Annual Congress to North Wales as follows:—

The matter of venue has been considered in some detail, and it has been decided that facilities to hold the Congress will only be available at Llandudno during the 3rd week in September. The invitation, therefore, is to Llandudno during the 3rd week of September 1963.

Yours sincerely,
CLIFF EDWARDS.

Mr. John Anderson,
Secretary, B.V.A.,
7, Mansfield Street,
Portland Place, W.1.

Mr. Hebeler said it had been agreed in principle the year before that this invitation should be borne in mind for acceptance. He moved that Council accept the kind invitation of the North Wales Division to hold the Congress for 1963 at Llandudno.

Mr. E. Wilkinson seconded.

Mr. A. Steele-Bodger asked if the idea of Congress being held earlier rather than later could be borne in mind. The matter had cropped up before. Those whose wives were blessed with young children who had to go to school found that time of year rather difficult. When a place such as Llandudno was chosen, which was a holiday resort, Congress just about coincided with the children's return to school, which might cut down attendance at Congress by members' wives.

The President said Mr. Steele-Bodger would remember that Council had approved the idea that the Officers should look into the matter of future venues, and it had been suggested that a committee be formed to consider the whole question. There had been a preliminary meeting of the Officers and the General Secretary had already written to various people in different parts of the country asking for their views with regard to facilities which might be available for Congresses. The Officers believed, however, that it was not sufficient to have the views of people in local areas who were not experienced in Congress matters, and it was felt that at least one person from the main committee should visit these cities and towns before the decision was made. Would it meet the case if the committee were asked to keep in mind especially the question of the time of the year? That would certainly come into it because when information was received about certain towns or cities, the committee would be told: "You can have a Congress here late in September but we could not possibly put one on at an earlier time." The date would, therefore, have to be tied up with that consideration.

The recommendation to the Annual General Meeting was carried.

The President added that it would be a "bit of a squeeze" at Llandudno. It would be about the last time the Association would be able to go to a place as small as this. Presumably they could manage, but he knew the town and thought there would be great difficulty in finding enough room. They had already half-promised the local Division that they would go there; it might be one of the last times the B.V.A. would be the guests of a local Division. It was hoped in future that Council might dictate more where they would go and not wait for a Division to give an invitation.

To Receive the Report of the Committee Administering the Steele-Bodger Memorial Fund

The General Secretary said it had been recommended that Mr. Oliver Graham-Jones should receive £175 for a project to study management methods in zoos on the Continent. Secondly, that Mr. Ronald Jones of Glasgow, for a project concerned with the study of the bovine abomasum, should receive £60 for work in Denmark. To this sum, Mr. J. B. White had very generously added £30 from the Hall of Barry, Glamorgan, a prize which had recently been

awarded to him. Mr. Ronald Jones of Glasgow would, therefore, receive a total sum of £90.

The President said that the Committee had had great difficulty in making its decision, particularly this year, because there had been a number of applicants who might well have benefited from the Fund. It would have been easiest to give the whole amount available to one person; it was then considered whether it would be possible to split it, but the amount was not sufficient. By this very noble gesture from Mr. White, it had been possible to make an award to two people. Mr. Oliver Graham-Jones was present, and the President said he was pleased to know that Mr. Graham-Jones was one of the recipients. His work for the Association, in dealing with veterinary subjects that appealed to the public, did a great deal of good for the profession. He was glad that Mr. Graham-Jones would be able to go to the Continent and meet his colleagues in the same type of work.

Any Other Business

The General Secretary said it was requested that the Association's seal be used for two purposes. The first was to put the seal on the alteration of bonds as follows:—

Sale of:
£1,019 2s. 2d. Redemption 3 per cent. 1986/96.
£6,033 1s. 10d. Funding 3½ per cent. 1999/2004.
£6,000 Metropolitan Water Board "B" Stock (3 per cent. 1934/2003).

Purchase of:
£137 Bowater Paper Corporation Ord. making £400.
£240 British Petroleum Ordinary Stock making £400.
168 United Steel Companies Ordinary £1 shares (New) making 600.
600 Distillers Co. Ordinary 10s. (new).
1,100 Metropolitan Estate & Property Corporation Ordinary 5s.
150 Northern & Employers' Assurance Ordinary £1.
500 United Drapery Stores Ordinary.
400 F. W. Woolworth Ordinary 5s.

Sale of:
£284 18s. Kent C.C. 5½ per cent. 1974/78 leaving £300.

Purchase of:
200 The Merchants Trust Ordinary 5s.

It had been agreed, by the Honorary Treasurer and the President, on the advice of the Association's stockbrokers, that 50 per cent. of capital should be held in Government Stock and 50 per cent. in Ordinary Shares.

Secondly, a lease was due for renewal for premises at 7, Mansfield Street, back flat, leased to the Hon. R. A. Watkinson.

Mr. Wright asked if the rent remained as before.

The President said that that had been considered by the Finance Sub-committee. At that time, it was considered that the rent was at a level suitable for premises of the kind, and the agreement had already been made with the tenant with a view to renewal of his lease.

It was proposed by Mr. A. Steele-Bodger and seconded by Brigadier J. Clabby that the seal should be so used and the motion was carried.

The General Secretary reported that Dr. Campbell Dixon would be representing the Association at the South African Veterinary Medical Association Conference in September. He also reported the receipt of a letter from the Danish Veterinary Association stating that the annual congress of that Association would be held on September 23rd and 24th, 1961. (The letter was read.) From the provisional programme, it appeared that the Danish Minister of Agriculture would address the congress and short reports would be made.

The President said that during the previous year, he had been asked to represent the B.V.A. at the Danish meeting. He and his wife had been overwhelmed with kindness. As they were walking into the Council Chamber, members had seen Dr. Seidel and his wife who had come to the B.V.A. Congress. He could not describe how kind not only Dr. Seidel and his wife had been to them but every veterinary surgeon over there. He knew members of Council would extend an equally warm welcome to Dr. and Mrs. Seidel when they met them that evening and at other functions. He asked for suggestions for a B.V.A. representative at the Danish meeting.

Mr. S. Hignett moved that Mr. Beynon should represent the Association.

The motion was seconded and carried.

Mr. J. M. Ingram said he could not agree with the President more wholeheartedly. He had never recovered from his own visit to a Danish congress; his waist line had spread and never gone back.

The General Secretary read a letter from Dr. Hull stating that he had been invited to read a paper in Italy in September and asking whether Council wished him to convey fraternal messages.

It was agreed that Dr. Hull should be asked to convey the Association's greetings.

The General Secretary read a letter from the *Pig Farmer* with regard to the David Black Award.

Mr. A. J. Wright moved that the Officers consider the matter and, if they thought fit, send in a nomination. The motion was seconded and agreed.

Mr. Graham-Jones said that he felt very honoured to have received such a generous award. He wished to say that at the Council meeting, because he would be abroad at the Adjourned Annual General Meeting. He was grateful for the President's gracious remarks and appreciated them deeply. He wanted Council to know how valuable such an award was to a veterinary surgeon working in the zoological field, not so much for the money, which was valuable, but for the fact that it indicated a degree of support from the British Veterinary Association and its committees for the work of the veterinary surgeon in what had been a difficult atmosphere. It had taken a little time for professional zoologists to begin to realise that the veterinary profession had something to offer in the maintenance of the health and welfare of the captive wild animal, and the impact of such an award being made to him had already been considerable. He was, therefore, the more grateful for it.

The President said that on page 20 of the Handbook was published the agenda for the 79th Annual General Meeting. It was divided, in the usual way, into public proceedings and proceedings for members

only. Under " members only," the meeting was being asked to confirm the resolution that Dr. Frenkel be made an Honorary Member of the Association, and that Mr. Perry be elected an Honorary Life Member of the Association, and that Mr. Perry be elected an Honorary Life Member of the Association. It seemed a pity that honours which were being bestowed, particularly that on Dr. Frenkel, which would find favour in international circles, should be taken during a meeting for members only. With Council's permission, he wished to move these items into the agenda for the public proceedings. The reason they had been put into the second part of the meeting was in case there should be other than a unanimous vote, in which case it would be delicate in the presence of people who were not members of the Association. Even supposing someone objected, which was unlikely, and there had to be a vote taken, every non-member could be asked to leave the room during the counting of votes. Everything could be done in an orthodox manner. The President proposed, therefore, that items 10 and 11 should be moved forward into the public part of the meeting. This was agreed.

The President then said that Council now had to discuss the difficult business of swine fever and the revised Register of Vaccinated Herds Scheme. Council then moved into committee.

After a long and full discussion Council came out of committee, and Mr. Hebeler said he had perfect confidence in the President and Mr. Steele-Bodger to arrive at a fee which would be equitable and up to date. He would have great objection to binding them to an actual figure. There were so many combinations of figures that could be arrived at.

The proposal to leave the matter in these hands was agreed.

The President said that as it was the last Council meeting at which he would be President, he wished to thank members of Council for their support and their loyalty during the year. He thanked all the Standing Committees for their work also.

FIRST MEETING OF COUNCIL FOR 1961-62

The first meeting of the Council for 1961/62 was held in the Milner Hall, Rhodes House, Oxford, immediately after the adjourned Annual General Meeting on Saturday, September 9th, 1961.

The President, Mr. A. G. Beynon, was in the chair, and the following members were present:—

Dr. P. S. Blackburn, Miss W. M. Brancker, Mr. A. S. Chapman, Brigadier J. Clabby, Messrs. E. Conn, P. E. Curtis, T. C. Denholm (Hon. Secretary), A. C. Dixon, J. B. Edwards, J. Edwardson, I. G. George, A. M. Graham, E. J. Heather, H. F. Hebeler (Hon. Treasurer), G. N. Henderson, S. L. Hignett, D. G. Howell, J. M. Ingram, S. Jennings (Senior Vice-President), F. V. John, J. B. Johnston, R. M. Loosmore, V. J. A. Manton, D. G. Morgan, J. H. Parsons, J. A. Pasfield, E. M. Pittaway, Mrs. L. R. Robinson, Mr. W. J. B. Robson, Dr. K. C. Sellers, Messrs. A. Sutherland, A. Thomson, Mrs. M. Weipers, Messrs. J. B. White (Junior Vice-President), E. Wilkinson, Dr. A. J. Wilsdon, Mr. A. L. Wilson, Dr. W. R. Wooldridge, Mr. A. J. Wright.

Apologies for Absence

The Secretary read apologies for absence from:—

Mr. A. J. Adams, Dr. F. Alexander, Dr. E. C. Appleby, Messrs. G. Atkinson, I. S. Beattie, A. J. Beeson, Lt.-Col. G. N. Bushman, Messrs. J. G. Buxton, E. R. Callender, J. A. Dall, Dr. G. O. Davies, Messrs. J. Donald, G. N. Gould, O. Graham-Jones, Lt.-Col. D. A. Green, Messrs. I. G. Hall, A. Hector, S. F. J. Hodgman, R. Hunnam, Malcolm McClellan, T. M. McNabb, D. Reid Marshall, Dr. R. F. Montgomerie, Messrs. D. F. Oliver, G. M. G. Oliver, J. S. Paterson, Dr. J. K. L. Pearson, Captain R. N. Phillips, Messrs. G. S. Powley, John Rankin, R. Renfrew, H. G. Sucock, A. Steele-Bodger, D. L. Stewart, Mrs. G. M. Stuckley, Messrs. A. Sutherland, E. G. Sutton, J. Stamp, P. J. Stead, Miss O. Uvarov.

Membership of Standing Committees for 1961/62

The Council received the recommendations of the Nominations Committee.

Miss M. J. Freak said that since the nominations for the Editorial Committee were submitted, she had received a letter from Miss Joshua asking whether, in view of the fact that she might not be able to attend some of the meetings in the next year, she could leave the Committee as a full member and continue to serve as a co-opted member. If that were agreed, Miss Freak said, she would propose that Mr. Pattison's name be submitted in place of that of Miss Joshua.

The proposal was seconded, and adopted. The new Standing Committees are as follows:—

GENERAL PURPOSES AND FINANCE COMMITTEE
20 Members plus Past-Presidents (names italicised) and Chairmen of other Standing Committees

Anderson, K. P.; *Anderson, L. G.;* Atkinson, G.; Brancker, W. M. (Miss); *Bruford, J. W.; Callender, E. R.; De Vine, W. J. B.;* Edwards, J. B.; Edwardson, J. O.; Gould, C. N.; *Graham, A. M.;* Graham-Jones, O.; *Hancock, R. C. G.;* Hardwick, E. F.; Henderson, G. N.; *Hignett, S. L.; Hodgman, S. F. J.;* Hughes, D. L.; *Ingram, J. M.;* John, F. V.; King, J. O. L.; *Miller, Wm. C.; Mitchell, W. M.; Montgomerie, R. F.;* Moss, J. A.; *Nairn, W.;* Oliver, D. F.; Pasfield, J.; *Robertson, A.;* Sellers, K. C.; Steele-Bodger, A.; Taylor, A. M.; *Thomson, A.;* Tullis, G.; Tweed, W.; Uvarov, O. (Miss); *Wilkinson, E.; Wooldridge, W. R., Wright, A. J.*

Reserves: Howell, D. G.; Dall, J. A.; McGhee, J. H.; Freak, Miss M. J.; Robson, W. J. B.; Alexander, F.

TECHNICAL DEVELOPMENT COMMITTEE
26 Members

Anderson, K. P.; Beaumont, G. L.; Blackburn, P. S.; Brancker, W. M. (Miss); *Bruford, J. W.;* Dall, J. A.; Field, H. I.; Hignett, S. L.; Inglis, J. S. S.; *Ingram, J. M.;* King, J. O. L.; Loosmore, R. M.; McIntyre, W. I. M.; *Montgomerie, R. F.;* Moss, J. A.; Oliver, D. F.; Osborne, A. D.; Pearson, J. K. L.; *Robertson, A.;* Sellers, K. C.; Stamp, J. T.; Taylor, E. L.; Towers, K. G.; Wilson, A. L.; *Wooldridge, W. R.; Wright, A. J.*

Reserve: R. S. F. Campbell.

VETERINARY STATE MEDICINE COMMITTEE
20 Members

Atkinson, G.; Beattie, I. S.; Buxton, J.; *Callender, E. R.;* Chapman, A. S.; Curtis, P. E.; Edwards, J. B.; Hardwick, E. F.; McGrath, R. E.; Male, N. P.; Millar, J.; Nicholson, D. S. S.; Osborne, A. D.; O'Sullivan, K.; Silcock, H. G.; Tweed, W.; Wilsdon, A. J.; *Wilkinson, E.;* Wood, S. W.; Wyse, G.

Reserves: Campbell, R. S. F.; and Heather, E. J.

FARM LIVESTOCK COMMITTEE
20 Members

Brown, G. F.; Chapman, A. S.; Chipperfield, T. A. R.;

Heath, G. B. S.; Hignett, S. L.; Howell, D. G.; John, F. V.; Johnston, J. B.; Loxam, J. G.; McGhee, J. H.; Muir, R.; Parsons, J. H.; Pettett, D. W. S.; Robson, W. J. B.; Searles, G. W.; Stewart, D. L.; Weipers, M. L. (Mrs.); *Wilkinson, E.; Wright, A. J.;* Wyse, G.

Reserves: Marshall, D. R.; Pugh, P. D. S.; and also Chairman, T. D. C., co-opted.

PARLIAMENTARY AND PUBLIC RELATIONS COMMITTEE

20 Members

Callender, E. R.; Chipperfield, T. A. R.; Forster, J.; Green, D. A.; Hall-Patch, P. K.; Henderson, G. N.; Hunnam, R.; Graham-Jones, O.; James, R. A.; Jones, B. V.; Loosmore, R. M.; Mann, T. B.; McCunn, Professor J.; Pasfield, J. A.; Stead, P. Y.; Stuckey, G. N. (Mrs.); Sutton, E. G.; *Thomson, A.;* Uvarov, O. (Miss); *Wooldridge, W. R.*

Reserves: George, I. G.; and Powley, G. S.

HOME APPOINTMENTS COMMITTEE

20 Members

Appleby, E. C.; Beeson, A. J.; Clabby, J.; Crowhurst, F. A.; Davies, G. O.; Edwardson, J.; Gordon, F. A.; Jordan, F. T. W.; Laugier, G. V.; Lucas, J. M.; McGhee, J. H.; Manton, V. J. A.; Morgan, D. G.; O'Sullivan, K.; Pettett, D. W. S.; Singleton, A. G.; Steele-Bodger, A.; Sutherland, A.; Taylor, A. M.; Tullis, G.;

Reserves: Rankin, J. E. F.; and Hall-Patch, P. K.

SMALL ANIMALS COMMITTEE

20 Members plus R.S.P.C.A. Liaison Officer (ex officio)

Adams, A. J.; Appleby, E. C.; Brown, G. F.; Bushman, G. N.; Carr, W. H.; Cole-Powney, Mrs. K. M.; Dalby, M. (Miss); Dixon, A. C.; Evans, K. G. D.; Freak, M. J. (Miss); Hall, I. G.; *Hodgman, S. F. J.;* Jenkins, E. D.; Oliver, D. F.; Oliver, G. M. G.; Pittaway, E. M.; Robinson, Mrs. L. A.; *Thomson, A.;* Woodrow, C. E.; Young, M.

R.S.P.C.A. Liaison Officer: H. E. Bywater.

Reserves: F. Chambers; and E. J. Heather.

OVERSEAS COMMITTEE

15 Members

Beaton, W. G.; Chalmers, A. W.; Cronly, A.; Fisher, R. C. U.; Lancaster, W. E.; McCulloch, J.; Marshall, R. S.; Phillips, R. N.; Piercy, S. E.; Rollinson, D. H. L.; Scott, W. A.; Simpson, S.; Smith, D. F. G.; Taylor, J. I.; Wright, R. A.

EDITORIAL COMMITTEE

6 Members

Alexander, F.; Freak, M. J. (Miss); Hughes, D. L.; *Ingram, J. M.;* Jarrett, W. F. H.; Joshua, J. O.

The Officers of the Association are *ex officio* members of all Standing Committees.

Dates for Future Council Meetings

The following dates were fixed for Council and Committee Meetings for 1961/62:—

November 15th, 16th and 17th.
January 10th, 11th and 12th.
April 11th, 12th and 13th.
July 11th, 12th and 13th.

Consideration of the venues was deferred until the November meeting.

Matters Requiring Urgent Attention

The General Secretary read a letter which had been received from the National Farmers' Union in connexion with the Council's proposal relating to the revised Register of Vaccinated Herds scheme.

After some discussion in committee, Mr. Hignett said Council should place on record its appreciation of the efforts of those who had negotiated on behalf of the Association.

On the motion of Dr. Wooldridge, a warm vote of thanks was accorded to the President for his conduct of the meeting, and the proceedings then terminated.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the date on which disease has been confirmed, followed by the postal address and local authority.

Anthrax

October 27th, 1961. Messrs. Geach Bros., Treworrick, St. Cleer, Liskeard, Cornwall (Parish: St Cleer). (Cattle.) CORNWALL.

October 27th, 1961. C. Hooper, Coombe House, St. Neot, Liskeard, Cornwall (Parish: St. Neot). (Cattle.) CORNWALL.

October 30th, 1961. H. R. B. Hodge, Craiglemine, Whithorn, Newton Stewart, Wigtownshire (Parish: Glassington). (Cattle.) WIGTOWNSHIRE.

October 30th, 1961. J. Rea, Manor Farm, Brimfield, Ludlow, Salop (Parish: Brimfield). (Cattle.) HEREFORDSHIRE.

Fowl Pest

October 24th, 1961. P. Lory, Home Farm, Langleybury, King's Langley, Herts. Disease at: Grove Farm, King's Langley, Herts. HERTFORDSHIRE.

October 24th, 1961. W. Lee, One Pin Farm, Farnham Common, Slough, Bucks. BUCKINGHAMSHIRE.

October 24th, 1961. J. W. Seymour, Fen Lane, East Keal, Spilsby, Lincs. LINCOLN, PARTS OF LINDSEY.

October 24th, 1961. G. R. G. Ayres, 33, Silfield Road, Wymondham, Norfolk. NORFOLK.

October 25th, 1961. R. Mills, 54, Astley Road, Hemel Hempstead, Herts. HERTFORDSHIRE.

October 25th, 1961. C. Long, Ltd., Cycamore Farm, Kenton, Stowmarket, Suffolk. EAST SUFFOLK.

October 27th, 1961. W. M. & R. L. Wink, Willow Farm, Coddenham, Ipswich, Suffolk. EAST SUFFOLK.

October 28th, 1961. J. Hartman, Lovelace, Fane Road, Thundersley, Essex. ESSEX.

October 28th, 1961. D. R. Skinner, Bottom End Farm, Dunston, Norwich, Norfolk. NORFOLK.

October 29th, 1961. E. Watts, Fairview, High Road, Fobbing, Stanford-le-Hope, Essex. ESSEX.

October 29th, 1961. Miss P. Rushbrook, 201, Nevendon Road, Wickford, Essex. ESSEX.

October 30th, 1961. A. A. Mason, Elms Farm, Gt. Barton, Bury St. Edmunds, Suffolk. WEST SUFFOLK.

October 30th, 1961. H. A. Digby, Bulphan Poultry Farm, Bulphan, Upminster, Essex. ESSEX.

October 30th, 1961. H. A. Hathaway, Valley Farm, Staverton, Cheltenham, Glos. GLOUCESTERSHIRE.

Swine Fever

October 24th, 1961. K. Noble, Mill Farm West, South Cave, Brough, Yorks. YORK, EAST RIDING.

October 24th, 1961. F. Nadin, Ford Farm, Cheddleton, Leek, Staffs. STAFFORDSHIRE.

October 25th, 1961. Mrs. E. V. Long, Frogmill Farm, Hurley, Maidenhead, Berks. BERKSHIRE.

October 25th, 1961. W. Kiddle, Ivy Farm, Brick Kiln Road, Heveningham, Norwich, Norfolk. NOR 04Y. NORFOLK.

October 25th, 1961. J. Brassington, Greenhead Farm, Kingsley Moor, Stoke-on-Trent, Staffs. Disease at: Youngs Green Farm, Kingsley Moor, Stoke-on-Trent, Staffs. STAFFORDSHIRE.

October 26th, 1961. R. T. Wildman, Skythornes Farm, Cowling, Keighley, Yorks. YORK, WEST RIDING.

October 27th, 1961. N. E. Ball, Park Farm, Bosham, Chichester, Sussex. WEST SUSSEX.

October 30th, 1961. H. Rawson, Abbey Farm, Preston, Hull, Yorks. Disease at: 85, Leads Road, Stoneferry, Hull, Yorks. YORK, EAST RIDING.

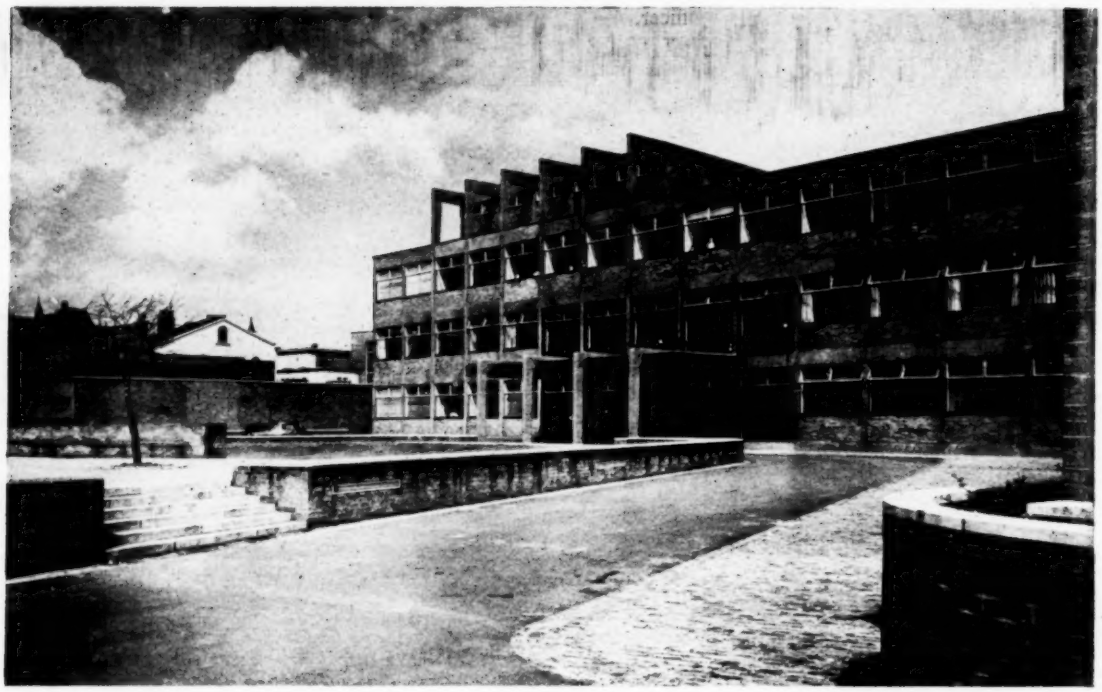
October 30th, 1961. R. V. Morris, Newfields, St. Margarets, Vowchurch, Hereford. HEREFORDSHIRE.

October 30th, 1961. R. Roberts, Casa Mia, North Gorley, Fordingbridge, Hants. HAMPSHIRE.

October 30th, 1961. R. W. J. Sims, Bridge Bungalow, Horstead, Norwich, Norfolk. NORFOLK.

October 30th, 1961. C. D. Petersen, Corner Cottage, Burton Constable, Hull, Yorks. YORK, EAST RIDING.

October 30th, 1961. B. Redwood (Highlands Farms Ltd.), Highlands Farm, Mayland, Chelmsford, Essex. ESSEX.



The new building, and the old one which it replaces. The passing of the latter may leave a pang in the minds of many of the School's alumni; but perhaps it is not altogether fanciful to see in the change from one premises to the other a symbol of the forward movement of the whole profession over the past few decades.

New Veterinary Buildings at Liverpool University

Honorary Degrees for Two Veterinarians

A HUGE development programme for the University of Liverpool, which is resulting in a number of impressive new buildings within a planned and ordered precinct and making this university as notable in physical amenities as it has long been in scholarship, was carried another stage forward last week-end, when at Open Days on October 27th and 28th a large number of privileged guests had the opportunity of being conducted over the new buildings for Veterinary Anatomy and Veterinary Pathology, and for Mathematics (with Oceanography). The official opening of these buildings was made the occasion for a Congregation for the conferment of honorary degrees, at which Sir

John Ritchie, C.B., Chief Veterinary Officer, and Dr. W. R. Wooldridge, Scientific Director of the Animal Health Trust, were each awarded the Doctorate of Veterinary Science (*honoris causa*).

It may well have been a source of pride to these gentlemen, as it must be to all their colleagues, that on a very notable occasion, and by virtue of their own achievements, they were numbered among a company of graduands of outstanding distinction, the others receiving academic honours being Dr. G. E. R. Deacon, Director of the National Institute of Oceanography, Professor Sir William Hodge, Lowden Professor of Astronomy and Geometry at Cambridge University, Mr. Michael James Lighthill, Director of the Royal Aircraft Establishment, Farnborough; Lord Birkett of Ulverston, chairman of the Court of the University of London, Sir Geoffrey Crowther, managing director and former editor of *The Economist*, and Professor Sir William Holford, Professor of Town Planning, University College, London.

The ceremony was held in the Philharmonic Hall on October 28th. After a short organ recital—all too short for lovers of fine organ playing—by Dr. Caleb Jarvis, the great procession of university teachers, administrators, and civic dignitaries, followed by the graduands, the Esquire Bedell and the Chancellor moved into the hall and on to the spacious platform. Only a photograph in colour could do justice to the scene. The variegated array of academic robes, scarlet, blue, maroon, gold, purple and black, the traditional wigs and bands of the legal officers, the glittering lord mayoral and mayoral regalia, all with the Chancellor as its centre, combined to make a picture of dignified splendour that will remain long in the memories of all who saw it.

After the Chancellor had declared the Congregation open, the Public Orator presented each graduand in turn, recounting with admirable felicity, spiced from time to time with a most grateful wit, the careers and achievements which merited senior degrees. This, indeed, was a moving recital of pre-eminent contributions to learning, law, education, architecture and animal health and veterinary research. It attested in full measure that the University of Liverpool does not bestow its honours lightly, and that those who earn them have contributed lastingly to the life of the community.

Introducing Sir John to the Chancellor of the University (the Marquess of Salisbury), the Public Orator (Professor Kenneth Muir) said: "He is an Aberdonian, and we have it on the authority of the great Dr. Johnson that 'much may be made of a Scotchman if he be caught young.' John Ritchie was educated at the Royal (Dick) Veterinary College and

This photograph of the museum typifies the light, spacious, and tasteful interior of the whole of the new building.

the University of Edinburgh, and spent the first 20 years of his professional life in Scotland.

"His rise was rapid. After being one of the veterinary surgeons of the corporation of the city of Edinburgh, and county veterinary officer for Midlothian, he was made senior veterinary officer in the Department of Agriculture for Scotland only 10 years after he had qualified. Scottish farmers were years ahead of their English counterparts in the eradication of tuberculosis from their cattle by means of tuberculin testing, and John Ritchie was one of those chiefly responsible for directing the veterinary aspects of the scheme.

"In 1938 he was appointed as the Ministry's superintending veterinary officer for the division of Perth, Fife, Clackmannan, Angus and Kincardine; and in 1945, somewhat to his regret, he was transferred to London as deputy chief veterinary officer in the Ministry.

"After a year, he escaped to a similar post in Edinburgh, but in 1952, he was appointed Chief Veterinary Officer of the Ministry of Agriculture, Fisheries and Food, a post in which he acquitted himself so brilliantly that he was made a Companion of the Bath in 1955, a Fellow of the Royal Society of Edinburgh, and became President of the Royal College of Veterinary Surgeons in 1959, an office he held for 2 years. In the New Year Honours of 1961 he was knighted.

"This last honour came at an appropriate time, for tuberculosis was finally eradicated from the cattle in Great Britain this year, and Sir John Ritchie, more than any other man, is responsible for this achievement. He has done as much for the health of the animal kingdom as anyone now living, for which he has earned the gratitude of us all. His name should be revered not merely wherever two or three veterinary surgeons are gathered together, but in every home in the kingdom and even, we might almost say, in every byre and sheepfold throughout the world."

In commending Dr. Wooldridge, the Public Orator said:—

"He was born in London and the only record we have of his school career is that he became sergeant-major of the O.T.C! He proceeded to Birkbeck College where he graduated with first-class honours in chemistry. He then took the advice of his uncle George—Professor G. H. Wooldridge—and studied at the Royal Veterinary College, becoming Centenary Medallist in 1924.

"A year later, a post-graduate award at Gonville and Caius College enabled him to pursue research into the problem of enzymes in bacterial chemistry. He also pursued the Newnham undergraduate who later became his wife. He took his M.Sc. (London) in 1927 and his doctorate at Cambridge in the following year.

"After holding several research posts, he was appointed to the staff of the London School of Hygiene and Tropical Medicine. He began to publish valuable contributions on bacterial metabolism, and it has been suggested that his research had an influence on his own character since he soon came to act as a catalyst in the affairs of his chosen profession.

"He served as President of the Veterinary Research Club, and later as its honorary secretary. He has also been President and secretary of the National Veterinary Medical Association, as it then was, chairman of the Parliamentary and Public Relations Committee, vice-President of the Parliamentary and Scientific Committee, secretary of the Fourteenth International Veterinary Congress, Director of Veterinary Services for the National A.R.P. Animals Committee, a governor of the National College of Food Technology, a member of the Permanent International Veterinary Committee, chairman of the governors of Birkbeck College, a governor of the London School of Tropical Hygiene, and of the Royal Veterinary College, London.

"He was a prominent member of the Loveday Committee whose deliberations led to the passing of the Veterinary Surgeons' Act of 1948—an Act which was particularly gratifying to Liverpool since for over 40 years a School of Veterinary Science had been an integral part of the University.

"Dr. Wooldridge's chief title to fame remains to be mentioned. In 1942 he conceived the idea of a Veterinary Educational Trust, later to be known as the Animal Health Trust, which has not only made some 200 awards for post-graduate research but has also its own research stations for the study of the diseases of farm livestock, horses, dogs and poultry.

"Dr. Wooldridge followed our own Professor Glover as President of the Royal College of Veterinary Surgeons in the year 1954-5. More recently he was appointed to the committee set up by the Jockey Club under the chairmanship of the Duke of Norfolk to inquire into the doping of race-horses—and it forms a last example of the disinterested pursuit of truth which has earned for Dr. Wooldridge the esteem of his colleagues in the profession he adorns."

At the conclusion of the degree ceremony Lord Birkett, in a characteristically eloquent, graceful and witty speech, thanked the University on behalf of the new graduates, and the procession, led by the Chancellor, then left the hall.

There followed a luncheon in the Adelphi Hotel in honour of the new graduates. The Chancellor presided, and among the large company were the Presidents of the British Veterinary Association and of the R.C.V.S., Professor E. G. White, Dean of the Faculty of Veterinary Science, and Mrs. White, Professor and Mrs. J. G. Wright, and Professor and Mrs. D. L. Hughes. In proposing the toast to the honorary graduates the Vice-Chancellor recalled that Liverpool was the first English university to have a professorial Chair in veterinary science. The other speakers were Sir Geoffrey Crowther, the Lord Mayor of Liverpool, the Chancellor, and Professor Sir William Hodge.

The New Buildings

The Building Sub-Committee under the Chairmanship of Mr. E. A. G. Caröe was formed in 1955 and Mr. E. Maxwell Fry, C.B.E., F.R.I.B.A., was appointed

the architect. Under his direction, building operations began in February, 1959, and were completed in December, 1960.

The building has an area of 46,130 sq. ft. and a capacity of 724,000 cu. ft. and its cost was about £250,000. It comprises a main section of three floors, flanked on each side by single-storey wings built around open yards. The main part and the wings enclose a forecourt in which there are a grass lawn, a fountain and pool, and flower beds. The brick surfaces facing Brownlow Hill are embellished by incised murals of animal figures by Mr. E. Peskett.

In the main section, on the ground floor opposite a spacious entrance hall, are a students' reading room and a staff library. There is also accommodation for the Dean of the Faculty and his staff. The remainder of the ground floor is occupied by the staff laboratories of the Department of Veterinary Anatomy, a bone room, and a photographic unit of the Department of Veterinary Pathology and Bacteriology.

The accommodation on the first floor is grouped around a large museum which is shared by the two departments and extends from one side of the building to the other. Each department also has its own practical classroom with bench accommodation for 40 students. There is a tutorial room adjacent to the pathology practical classroom and the anatomy practical classroom has adjacent to it a large histological preparation room. There is office accommodation also for the heads of both departments.

The second floor is occupied by the Department of Veterinary Pathology and Bacteriology. Accommodation includes staff laboratories, a unit for virological work, and service rooms for the washing and sterilisation of glassware, media preparation and tissue processing. There is also a laboratory for post-graduate practical classes with bench space for 16 students.

The Anatomy wing includes a large dissecting room with cold store and X-ray facilities for anatomical studies: a tank room and preparation rooms are adjacent. Around the open yard are large-animal loose-boxes, accommodation for laboratory animals and experimental rooms. The teaching accommodation comprises a lecture theatre and a tutorial room.

The Pathology wing also has a large open yard bounded on its southern end by the Veterinary Investigation Centre of the Ministry of Agriculture, Fisheries and Food. Opening into this yard are loose-boxes for farm animals and a unit for the breeding and maintenance of stocks of laboratory animals. At the north end of the enclosure are *post-mortem* rooms, a cold store, a gas cremator and a diagnosis laboratory. The wing is completed by a large lecture theatre with seating for over 100 people.

The site of the new building provides space for the erection, at a future date, of a new veterinary hospital for small animals; and in the meantime the original hospital has been extensively modified to meet present-day needs. Other future plans will add, it is hoped, to the buildings and equipment at Leahurst, the School's field station.

Looking round the splendid new building it was not difficult to imagine the satisfaction and pleasure not only of Professor Hughes and Professor King who, with their staffs and students will make use of it, but also of Professor White, the new Dean of the Faculty, and Professor Wright whose deanship since the Veterinary Faculty was separately established in 1952 has added so much lustre to the School and to his own name. Last week-end, in fact, was a great occasion both for the honouring by a famous university of two members of our profession, and for the furtherance of that profession's teaching and research.

News and Comment

AGRICULTURAL RESEARCH COUNCIL RADIOBIOLOGICAL LABORATORY REPORT FOR 1960*

Although this report is devoted largely to surveys of radioactivity in human diets, it has significance for members of the veterinary profession because of the important part they play in the production of much of the food concerned.

Whilst the element strontium in many ways behaves like its familiar relative, calcium, its present intrusion in the scientific press is due to the occurrence of a radioactive form, strontium 90, in the fall-out from the fissile atomic bomb, the so-called "dirty bomb."

For any living organism the ingestion of radioactive substances may have serious consequences, the gravity of which will depend upon, first, the weight of material that has been swallowed, second, the kind—and the amount per unit weight—of radiation produced by the element in question, third, the duration of its stay in the body and, last, the time taken by the radioactive element to decay.

In tending to become lodged in the bones strontium 90 shows its likeness to calcium: its rate of decay is such that 20 years will go by before half of any given quantity of strontium 90 will have degenerated into less dangerous products, and half a human lifetime must elapse before its activity has declined to one quarter of the initial value. Its unpleasant character and its ability to give rise to bone tumours thus need no stressing.

Strontium 90 may fall as dust on the earth but, as this report suggests, most of it is swept out of the air by rain. For clear reasons stations maintained in Great Britain and Northern Ireland regularly assay soil, the crops grown thereon, and foods, such as milk, cheese and eggs, that are the secondary products of the different areas. Studies are made also of foodstuffs imported into Britain, but in the current report most attention has been given to milk.

As compared with the 1959 figures, those of 1960 showed that the average human intake of strontium

* 76 pp. Her Majesty's Stationery Office. Price 6s. 6d.

90 had declined by about one-third and that, on the whole, it was only about one-thirtieth of the maximum permissible level. Even in certain "special areas" the level was only about twice that of the national average.

Nevertheless, it is impossible to say that levels so low will produce no undesirable results whatsoever. Furthermore, the resumption of the testing of atom bombs is likely to result in increased deposition of strontium 90 during the coming months. From the veterinary point of view, therefore, attention may be drawn to the special areas, the higher activity of the products of which appear to be due to:—

"(a) High rainfall, which causes the deposition of strontium 90 to exceed the average.

(b) The slow growth of pastures and the development of a considerable mat in which recently deposited strontium 90 is retained and from which it readily enters the tissues which cattle consume.

(c) Calcium-deficient soils which not only enhance the absorption of strontium 90 from the soil but also can lead to low concentrations of calcium within plants so that the strontium 90 which lodges directly upon them is associated with relatively little calcium."

The report gives data relating to other fission products and their characteristics from the point of view of crop production but, as already indicated, most attention is devoted to strontium 90. Some 36 Tables and 16 Figures illustrate the information provided by the report, which, though terse, is not difficult to read and which, in these present times, should be seen by many veterinary surgeons.

UNIVERSITY NEWS

Bristol

Professor T. K. Ewer, recently appointed to the Chair of Animal Husbandry, delivered his inaugural address on Thursday evening, October 19th. A large audience assembled in the reception room of the University, heard an excellent paper entitled *Animal Husbandry in a Technological Age*.

With the aid of lantern slides Professor Ewer traced the development of animal husbandry, with particular reference to its practice in this country. He discussed the changing needs of agriculture, brought about by the rapidly increasing world population, stressing the responsibility this placed on the shoulders of veterinary scientists. He outlined the important part the profession could play in world progress if they accepted this challenge.

The new session commenced on October 5th with 28 freshers and a total of 119 students in the Veterinary School.

On October 9th the President and members of the Centaur Society held a Freshers' Evening at Langford House, to which members of the staff were invited. The evening was a great success and amongst other entertainments a number of excellent films were shown. On November 25th the first Centaur Society games will be held at Langford. These will take the form of inter-year sports in the afternoon, followed by a dance in the evening.

The following staff appointments have been made:—

D. L. Dungworth, B.V.SC., PH.D., M.R.C.V.S., Lecturer in Clinical Pathology (Veterinary).

M. R. Wilson, B.V.SC., M.R.C.V.S., Junior Fellow in Clinical Pathology (Veterinary).

R. E. W. Halliwell, B.A., VET.M.B., M.R.C.V.S., Junior Fellow in Veterinary Surgery.

PERSONAL

Births

CRAWFORD.—On October 15th, 1961, to Jill, wife of S. B. Crawford, B.V.M.S., M.R.C.V.S., of Gills Farm, West Down, Ilfracombe, a daughter, Jane Paula.

HOGGER.—On October 1st, 1961, to Beryl, wife of David G. Hogger, B.VET.MED., M.R.C.V.S., at Willow Lawn, Hempsted, Gloucester, a son, Robin George.

Engagement

OWENS—COOIL.—The engagement is announced between Thomas Owens, B.V.SC., M.R.C.V.S., and Jean Cooil, B.A., both of the Sudan United Mission, Jos, Nigeria.

COMING EVENTS

November

7th (Tues.). B.S.A.V.A. REGION 3. Meeting at Allen & Hanburys, Ware. Closing date for applications, November 1st.

8th (Wed.). CAMBRIDGE SOCIETY FOR THE STUDY OF COMPARATIVE MEDICINE. Annual Meeting in the Lecture Theatre of the Post-graduate Medical School, Addenbrooke's Hospital, Cambridge, 8 p.m.

9th (Thurs.). V.V.B.F. DUMFRIES AND GALLOWAY DIVISION. Annual Buffet Dance at the Cairndale Hotel, Dumfries.

B.S.A.V.A. SUSSEX REGION. Meeting at the New Imperial Hotel, First Avenue, Hove, 8 p.m.

10th (Fri.). R.V.C. COMMEMORATION BALL. To be held at the Royal Veterinary College, Camden Town, N.W.1, 8 p.m.

ROYAL VETERINARY COLLEGE ASSOCIATION. 6th Annual General Meeting at the R.V.C., London, 5.30 p.m.

15th (Wed.). MIDLAND COUNTIES VETERINARY ASSOCIATION. Meeting in conjunction with the Warwickshire Veterinary Club at the Regent Hotel, Leamington Spa, 2.30 p.m.

15th, 16th and 17th (Wed., Thurs. and Fri.). B.V.A. Committee and Council Meetings in London.

16th (Thurs.). V.V.B.F. NORTHERN DIVISION. Annual Dinner Dance in the Northern Hotel, Aberdeen, 7.30 p.m.

BRITISH INSTITUTE OF RADIOLOGY. First Meeting at the British Institute of Radiology, 32, Welbeck Street, London, W.1, 8 p.m.

18th (Sat.). EQUINE VETERINARY SOCIETY. Inaugural Meeting at the Royal Veterinary College, Camden Town, N.W.1, 2.30 p.m.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Valete

Sir,—Having decided not to seek re-election to the Council of the R.C.V.S. next year, I should like to express my sincere thanks to those who have recorded their votes for me during the past 26 years. This does not mean that I am retiring from active professional life, but I consider that now is the time for me to create a vacancy which I hope may be filled by one of the younger generation in whose hands the future of our profession is assured.

Yours faithfully,
J. F. D. TUTT.

"Rothiemurchus,"
St. Cross,
Winchester.
October 28th, 1961.

Etymological Derivation

Sir,—In News and Comment for October 21st (*Vet. Rec.* **73.** 1,047) your reviewer of *The Index of Veterinary Specialities* disliked the term "anti-diarrhoels." There was, I suggest, a misprint made somewhere, and the word, in fact, should have been either "anti-diarrhoeal" or "anti-diarrheal." The etymological derivation would then match that of "anti-dysenteric," as:—

Dysentery—dysenteric—anti-dysenteric.
Diarrhoea—diarrhoeal—anti-diarrhoeal.
Or Diarrhea or diarrheal or anti-diarrheal.

Yours faithfully,
L. W. GREENHAM.

University of Bristol,
Department of Bacteriology,
Canynge Hall,
Whatley Road,
Clifton,
Bristol, 8.
October 26th, 1961.

The Behaviour of Cattle in Crushes

Sir,—I have noticed the interest aroused in the profession by Mr. Ewbank's article and feel that the correspondence would not be complete without reference to the use of crushes in Southern Rhodesia. We are accustomed to handling thousands of semi-wild cattle at a time for inoculations, branding, tuberculin testing, and tongue inspections for foot-and-mouth disease.

Although varying considerably in design, construction and dimensions the basic pattern of a crush is a narrow race, often up to 60 ft. long, closed at either end with horizontal sliding bars. The front is often provided with a bail or vice consisting of 2 vertical bars hinged at ground level and operated by a lever, in which the animal's neck can be secured when closed, and through which the animal can escape when the bars are opened.

For the handling of large numbers the catching of each individual in this bail is too time-consuming, and the animals are packed into the race, all with their heads facing the same way, so tightly that they cannot move. Many operations can then be performed without further restraint being applied.

The success of this operation depends on the race being sufficiently narrow, and this raises difficulties when dealing with very long-horned cattle.

I would agree with Mr. Ewbank's classification of behaviour pattern but would suggest a fifth class—that of the aggressively escaping animal which climbs on top of its fellows or up the side of the race, often to fall back upside down into the bottom of the race, where it may become so entangled that, short of slaughtering and dismembering it on the spot, it can be extricated only by partially dismantling the race. Fortunately, the construction of most races lends itself to this sort of thing.

Cattle that are caught in the bail often assume the submissive kneeling posture and sometimes refuse to rise when released. Two effective and, I submit, relatively humane methods of persuading them to rise are either to bite the tail or, if this fails, to close the animal's mouth and nostrils, forcing it to make an effort to avoid asphyxiation. It always does.

I may have been lucky but I have never seen an animal seriously injured in this system of handling.

Yours faithfully,
J. A. LAWRENCE.

P.O. Box 46,
Umtali,
Southern Rhodesia.
October 27th, 1961.

The Humaneness of Cyanide

Sir,—One had hoped that adequate answers had been given to Mr. Pitcher's letter on his archaic method of "destroying" small animals. A correspondent has, however, now revived the subject in your issue of October 21st, in which he relates and extols some of the crudities of practice seen in his student days.

There are, of course, many still in active practice who started their professional life in the 20's. Even then we felt some shame in using the barbarous methods of destruction available at that time. Shooting, if efficiently carried out, was more merciful than the injection of strychnine or hydrocyanic acid, but was open to occasional unfortunate mistakes even in the most experienced and careful hands. Morphia was, of course, available for premedication in any method.

Those of us who qualified in the early 20's had no training in intravenous technique. When we learnt it, many of us used a solution of mag. sulph. and it seemed both theoretically and practically more humane. It was a short step from this to the use of barbiturates. In these we now have in our hands a perfect method of inducing euthanasia.

Of course, we used the tools available to us in our early years—and very inadequate they were. It has been our great good fortune to live through the following 40 years to see a marvellous revolution in drugs, instruments and techniques during this relatively short period. If we felt some sense of inadequacy and even shame 40 years ago, how should we feel now if we had not tried to keep abreast of these remarkable developments that have made our work so infinitely more efficient, interesting and humane?

Yours faithfully,
E. P. BARRETT.

28, Stoke Road,
Guildford.
October 28th, 1961.

Appeal for Clinical Material

Sir,—I feel sure that Mr. Watt will obtain all the clinical material he requires for his research into the treatment of osteogenic tumours at Edinburgh and yet still leave a few cases for treatment at veterinary schools south of the border.

For the past 2 years we have been actively engaged in this study in co-operation with the Westminster Hospital and we are most grateful to those veterinary surgeons who refer such cases to us for treatment. The technique we employ of isolated limb perfusion where practicable combined with intra-arterial injections of established drugs has been briefly described in *Research in Veterinary Science*, April, 1961, and preliminary results have been communicated to the Association of Veterinary Teachers and Research Workers' April Meeting in Blackpool and also at a post-graduate medical course on "The Treatment of Cancer" held in Cambridge last month. More recently we have been using a newly developed cytotoxic agent which is at present undergoing trials in man.

Some few dogs treated by us have tumours in regression and are leading relatively normal lives, but as all workers in the cancer therapy field know, a fairly large number of cases must be observed for a long time before the true value of treatment can be assessed.

The prognosis, as Mr. Watt so rightly implies, is dependent upon the stage of development of the tumour and I am about to submit for publication in THE VETERINARY RECORD an article on the differential diagnosis of bone tumours with particular reference to the first signs of osteosarcoma. If veterinary surgeons are able to submit these very early cases to centres where treatment can be carried out then the results of chemotherapy should improve.

Yours faithfully,
L. N. OWEN.

University of Cambridge,
Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.
October 30th, 1961.

The Use of Oxytetracycline in the Prevention of Neonatal Scouring in Piglets

Sir,—I was interested to read Beckett, Cruickshanks and Ellis's article in THE VETERINARY RECORD of October 28th, since I had met this condition as a widespread problem whilst practising in Shropshire. At the first sign of any piglet scouring, the routine treatment consisted of the injection of the entire litter with oxytetracycline. For economic reasons, Terramycin suspension in oil 25 mg. per ml. was employed at a dose rate of 2 ml. per piglet intramuscularly. This appeared to cause the piglets no discomfort, and almost invariably affected cases showed rapid recovery. It was significant that unaffected piglets within these litters remained free from scour, which indicates the probable value of Terramycin as a preventive in this condition. It was thought that the suspension in oil gave a more prolonged cover than the injectable solution due to its slower rate of absorption.

Assuming the origin of the infection to be the sow, *via* a subclinical mastitis, the strains of *E. coli* were typed by taking rectal swabs from infected piglets and were found, in most outbreaks, to be covered by "Aggrecovac"* *E. coli* vaccine. Thereafter, routine vaccination of the sows with Aggrecovac proved most effective in controlling the condition: it was also an easier, more satisfying and economic method to employ.

It is interesting to note that the mortality rate in untreated litters was considered to be 50 to 60 per cent. in that particular area as compared to the 20 to 30 per cent. mentioned in the above article.

Yours faithfully,
J. D. WILDGOOSE.

70a, Queen Street,
Horsham.
October 30th, 1961.

* Pfizer (formerly Bayer).

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th October, 1961		17	—	—	65	—	25
Corresponding period in	1960	2	—	7	45	—	41
	1959	15	1	—	70	—	58
	1958	13	—	1	47	—	36
1st January to 15th October, 1961		180	—	103	912	—	885
Corresponding period in	1960	161	1	28	1,496	—	929
	1959	196	2	9	610	—	983
	1958	132	5	115	584	—	1,026